

## **Draft Mitigated Negative Declaration**

The California Department of Water Resources (DWR) has reviewed the proposed project described below to determine whether it could have a significant effect on the environment as a result of project completion. "Significant effect on the environment" means a substantial, or potentially substantial, adverse change in any of the physical conditions within the area affected by the project including land, air, water, minerals, flora, fauna, ambient noise, and objects of historic or aesthetic significance.

**Name of Project:** 2011 Georgiana Slough Non-Physical Barrier Study

**Project Description:** The 2011 GSNPB Study is the installation and operation of a barrier using bioacoustic technology at the divergence of Georgiana Slough and the Sacramento River. The barrier is intended to create a behavioral deterrent for out-migrating juvenile salmonids to prevent entry to Georgiana Slough using sound, bubbles, and lights. In order to evaluate the efficacy of the barrier as a fish deterrent at this location, during barrier operation, a series of controlled releases of acoustically-tagged juvenile salmon smolts would be released at a selected location approximately 3 to 6 miles upstream of the barrier. Acoustic tag tracking systems would continuously monitor the area surrounding the barrier for fish presence, position, and passage through the area.

Barrier construction would begin mid- to late February 2011. Following installation, the barrier would be operated for up to 60 days, beginning after March 1, 2011. Upon completion of operation, the entire barrier structure and associated structures and equipment would be removed. Barrier removal would be complete by the end of May 2011. All disturbed areas will be restored to pre-project conditions.

**Project Location and Assessor's Parcel Number:** Sacramento River at the divergence of Georgiana Slough, just downstream of Walnut Grove in Sacramento County. The APN for the staging area is 156-0010-053.

**Mailing Address and Phone Number of Applicant Contact Person:** Jacob McQuirk, Chief, Temporary Barriers and Lower San Joaquin for California Department of Water Resources. 1416 Ninth Street, Room 215-23, Sacramento, CA 95814. (916) 653-9883.

### **Findings**

DWR finds the project described above will not have a significant effect on the environment in that the attached initial study identifies one or more potentially significant effects on the environment for which the project applicant, before public release of this Draft Mitigated Negative Declaration, has made or agrees to make project revisions that clearly mitigate the effects to a less-than-significant level. DWR further finds that there is no substantial evidence that this project may have a significant effect on the environment.

**Mitigation Measures Included in the Project to Reduce Potentially Significant Effects to a Less-Than-Significant Level**

**Biological Resources:**

BIO-MM-1: Conduct surveys to locate Swainson's hawk nest sites

BIO-MM-2: Minimize project-related disturbances within ¼ mile of active Swainson's hawk nest sites

BIO-MM-3: Conduct surveys to locate raptor nest sites

BIO-MM-4: Minimize project-related disturbances within ¼ mile of active nest sites

BIO-MM-5: Avoid and minimize effects on nesting birds

BIO-MM-6: Install exclusion fencing for western pond turtle

**Cultural Resources:**

CUL-MM-1: Limit landside excavation and vegetation removal to the first 3 feet of sediment and monitor landside excavations deeper than 3 feet

CUL-MM-2: Stop work and evaluate the significance of inadvertent discoveries; devise treatment measures as needed

**Noise:**

NOI-MM-1: Employ noise-reducing construction measures

NOI-MM-2: Employ noise-reducing operational measures

Additionally, DWR has committed to the following environmental commitments, which have been incorporated into the Project Description:

- Implement Sacramento Metropolitan Air Quality Management District's basic and enhanced construction emission control practices to reduce fugitive dust and exhaust
- Return disturbed areas to pre-project conditions
- Prepare and implement an Erosion Control Plan
- Implement turbidity monitoring during construction
- Participate in a worker environmental awareness program
- Conduct pile driving with a vibratory driver
- Monitor adult fish response
- Prepare and implement a Hazardous Materials Management Program
- Implement turbidity monitoring during construction
- Designate noise disturbance coordinator
- Install in-water signage

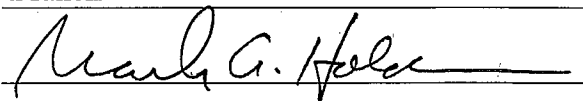
**Public Review Period**

Before January 25, 2011, any person may:

- (1) Review the Draft Mitigated Negative Declaration (MND); and
- (2) Submit written comments regarding the information, analysis, and mitigation measures in the Draft MND to the contact person above.

Name: Mark Holderman

Title: Chief, DWR Bay-Delta Office, South Delta  
Branch

Signed: 

Circulated on: December 27, 2011

Adopted on: \_\_\_\_\_



# **2011 GEORGIANA SLOUGH NON-PHYSICAL BARRIER STUDY INITIAL STUDY**

## **PREPARED FOR:**

California Department of Water Resources  
1416 9<sup>th</sup> Street  
Sacramento, CA 94236-001  
Contact: Jacob McQuirk  
916.653.9883

## **PREPARED BY:**

ICF International  
613 K Street, Suite 400  
Sacramento, CA 95814  
Contact: Jennifer Pierre  
707.280.9673

**December 2010**



ICF International. 2010. 2011 Georgiana Slough Non-Physical Barrier Study Initial Study. December. (ICF 00754.10.) Sacramento, CA. Prepared for California Department of Water Resources, Sacramento, CA.

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# Acronyms and Abbreviations

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|                   |  |
|-------------------|--|
| µg/m <sup>3</sup> | micrograms per cubic meter                         |
| 3D                | three-dimensional                                  |
| AB32              | Assembly Bill 32                                   |
| ACHP              | Advisory Council on Historic Preservation          |
| ARB               | California Air Resources Board                     |
| BO                | Biological Opinion                                 |
| CAAQS             | California ambient air quality standards           |
| CAT               | Climate Action Team                                |
| CCR               | California Code of Regulations                     |
| CEQ               | Council on Environmental Quality                   |
| CEQA              | California Environmental Quality Act               |
| CESA              | California Endangered Species Act                  |
| cfm               | cubic feet per minute                              |
| CFR               | Code of Federal Regulations                        |
| CH <sub>4</sub>   | methane  |
| CHRIS             | California Historical Resources Information System |
| cm                | centimeters  |
| CNDDDB            | California Natural Diversity Data Base             |
| CNEL              | community noise equivalent level                   |
| CNPS              | California Native Plant Society                    |
| CO                | carbon monoxide                                    |
| CO <sub>2</sub> e | CO <sub>2</sub> equivalents                        |
| Corps             | U.S. Army Corps of Engineers                       |
| CRHR              | California Register of Historical Resources        |
| CVP               | Central Valley Project                             |
| CWA               | federal Clean Water Act                            |
| dB                | decibels   |
| dBA               | A-weighted decibel                                 |
| Delta             | Sacramento–San Joaquin River Delta                 |
| DFG               | California Department of Fish and Game             |
| DIDSON            | Dual-Frequency Identification Sonar                |
| DPC               | Delta Protection Commission                        |
| DPM               | diesel particulate matter                          |
| DWR               | California Department of Water Resources           |
| EFH               | essential fish habitat                             |
| EIR               | environmental impact report                        |
| EPA               | U.S. Environmental Protection Agency               |

|                         |  |
|-------------------------|--|
| ESA                     | federal Endangered Species Act                           |
| FMP                     | Pacific Coast Salmon Fishery Management Plan             |
| fps                     | feet per second  |
| ft                      | feet   |
| FTA                     | Federal Transit Administration                           |
| GHG                     | greenhouse gas   |
| GSNPB                   | Georgiana Slough Non-Physical Barrier                    |
| GWP                     | global warming potential                                 |
| HFCs                    | hydrofluorocarbons                                       |
| HMMP                    | hazardous materials management plan                      |
| Hz                      | hertz  |
| I-5                     | Interstate-5   |
| IPCC                    | Intergovernmental Panel on Climate Change                |
| $L_{dn}$                | day-night sound level                                    |
| LED                     | light-emitting diode                                     |
| $L_{eq}$                | equivalent sound level                                   |
| $L_{min}$ and $L_{max}$ | minimum and maximum sound levels                         |
| LPG                     | liquid propane gas                                       |
| $L_{xx}$                | percentile-exceeded sound levels                         |
| Magnuson-Stevens Act    | Magnuson-Stevens Fishery Conservation and Management Act |
| MBTA                    | Migratory Bird Treaty Act                                |
| mi                      | Mile   |
| MILs                    | Modulated Intense Lights                                 |
| MLD                     | most likely descendant                                   |
| mm                      | millimeters  |
| MMRP                    | Mitigation Monitoring and Reporting Program              |
| MND                     | mitigated negative declaration                           |
| MOA                     | memorandum of agreement                                  |
| mph                     | miles per hour   |
| NAAQS                   | national ambient air quality standards                   |
| NAHC                    | Native American Heritage Commission                      |
| NCIC                    | North Central Information Center                         |
| ND                      | negative declaration                                     |
| NHPA                    | National Historic Preservation Act                       |
| NMFS                    | National Marine Fisheries Service                        |
| NO <sub>2</sub>         | nitrogen dioxide   |
| NO <sub>x</sub>         | oxides of nitrogen                                       |
| NPDES                   | National Pollutant Discharge Elimination System          |
| NRHP                    | National Register of Historic Places                     |

|                    |   |
|--------------------|---|
| NTUs               | Nephelometric turbidity units   |
| O <sub>3</sub>     | ozone   |
| OCAP               | Operations and Criteria Plan  |
| Ozone Plan         | 2009 Sacramento Regional 8-Hour Ozone Attainment and Reasonable Further Progress Plan |
| PFCs               | perfluorocarbons  |
| PM                 | particulate matter  |
| PM <sub>10</sub>   | particulate matter 10 microns in diameter or less                                     |
| PM <sub>2.5</sub>  | particulate matter 2.5 microns in diameter or less                                    |
| Porter-Cologne Act | Porter-Cologne Water Quality Control Act  |
| ppm                | parts per million   |
| ppt                | parts per trillion  |
| PRC                | Public Resources Cord   |
| proposed project   | Georgiana Slough Non-Physical Barrier Study   |
| Reclamation        | U.S. Department of the Interior, Bureau of Reclamation                                |
| ROG                | reactive organic gas  |
| RPA                | Reasonable and Prudent Alternative  |
| RWQCB              | Regional Water Quality Control Board  |
| SEL                | sound exposure level  |
| SF <sub>6</sub>    | sulfur hexafluoride   |
| SHPO               | State Historic Preservation Officer   |
| SMAQMD             | Sacramento Metropolitan Air Quality Management District                               |
| SO <sub>2</sub>    | sulfur dioxide  |
| SR                 | State Route   |
| State Water Board  | State Water Resources Control Board   |
| Station GES        | Sacramento River just downstream of Georgiana Slough                                  |
| Station GSS        | Georgiana Slough at Sacramento River  |
| SVAB               | Sacramento Valley Air Basin   |
| SWP                | State Water Project   |
| USC                | United States Code  |
| USFWS              | U.S. Fish and Wildlife Service  |
| USGS               | U.S. Geological Survey  |



## Background

The National Marine Fisheries Service (NMFS) issued the 2009 Biological Opinion (BO) for the Central Valley Project (CVP) and the State Water Project (SWP) Operations and Criteria Plan (OCAP) (National Marine Fisheries Service 2009). This BO included a Reasonable and Prudent Alternative (RPA) intended to reduce entrainment of fish at the state and federal pumps, among other fish protection goals. Action IV.1.3 of the RPA requires that the U.S. Department of the Interior, Bureau of Reclamation (Reclamation) and/or the California Department of Water Resources (DWR) consider engineering solutions to further reduce the diversion of juvenile salmonids into the interior and southern Sacramento–San Joaquin River Delta (Delta), and reduce exposure of the fish to SWP and CVP export facilities. This RPA Action is based on salmon migration studies that have shown losses of approximately 65% of outmigrating fish that are diverted from the mainstem Sacramento River into the waterways of the internal Delta. Diversion into the internal Delta increases the likelihood of predation, entrainment, and mortality associated with the SWP and CVP export facilities in the south Delta.

## Project Proponent and Purpose

As mandated in RPA Action IV.1.3 and described above, DWR plans to investigate engineering alternatives to reduce the diversion of juvenile salmonids into the interior Delta. One such alternative is the installation and operation of a non-physical barrier (barrier) consisting of a Bio-Acoustic Fish Fence™ (BAFF) at the divergence of Georgiana Slough from the Sacramento River. Several laboratory studies, as well as information collected at a similar barrier installed at the head of Old River, indicate that the barrier has the potential to meet the requirement set forth in the OCAP RPA. DWR is proposing to implement a pilot study, the 2011 Georgiana Slough Non-Physical Barrier Study (2011 GSNPB Study), in late winter to early spring 2011 to test the actual effectiveness of a barrier utilizing BAFF technology at Georgiana Slough.

Additionally, the 2011 GSNPB Study (proposed project) benefits would include:

1. reducing impacts of the SWP and CVP operations on outmigrating salmon smolts by keeping them in the Sacramento River and preventing them from entering the central and south Delta via Georgiana Slough;
2. maintaining SWP compliance with the federal Endangered Species Act (ESA); and
3. increasing the likelihood of successfully implementing improved through-Delta conveyance options.

# Regulatory Compliance

## California Environmental Quality Act

The California Environmental Quality Act (CEQA) requires that state agencies consider the environmental effects of projects over which they have discretionary authority before taking an action on those projects. CEQA requires that the lead agency (DWR) prepare an initial study to determine whether an environmental impact report (EIR), a negative declaration (ND), or a mitigated negative declaration (MND) is needed. An EIR would be required if any potentially significant impacts were identified that could not be mitigated to a less-than-significant level. An ND may be adopted if impacts are considered less than significant, and an MND may be adopted if the project would result in less-than-significant impacts with mitigation measures incorporated into the project.

As an initial study, this document evaluates the impacts of the proposed project (described in Chapter 2) and incorporates mitigation measures to eliminate or reduce impacts to a less-than-significant level. The CEQA Checklist (Appendix G of the State CEQA Guidelines) is the template for Chapter 3 of this initial study, and the impact analysis is provided under the respective questions in the checklist.

## Other Permits and Approvals

In addition to CEQA compliance, the project is being reviewed for the need to obtain permits and approvals under other federal, state, and local laws that may be applicable to the project. While these other permits and approvals are independent of the initial study and MND, they are being coordinated as closely as possible. This process includes review of the permits and approvals described in Table 1-1.

**Table 1-1. Regulatory Compliance Permits and Approvals**

| Authority/Agency   | Permit/Approval                     | Trigger  |
|--|-------------------------------------|--|
| U.S. Army Corps of Engineers   | Clean Water Act Section 404         | Work within waters of the United States                                |
| U.S. Fish and Wildlife Service   | Take Permit or Letter of No Effect  | Potential effects on species protected under the ESA                   |
| National Marine Fisheries Service  | Take Permit or Letter of No Effect  | Potential effects on species protected under the ESA                   |
| California Department of Fish and Game   | Take Permit or Letter of No Effect  | Potential effects on species protected under the CESA                  |
| California Department of Fish and Game   | Streambed Alteration Agreement      | Construction activity within waterside hinges of the levee             |
| Central Valley Regional Water Quality Control Board                                | Section 401 Certification or Waiver | Discharge to waters of the United States                               |
| San Joaquin Valley Air Pollution Control District                                  | Emission Reduction Credit Lease     | Particulate and exhaust emission impacts beyond established thresholds |
| ESA = federal Endangered Species Act.<br>CESA = California Endangered Species Act. |                                     |  |

# Document Organization

This document is organized as follows:

- Chapter 1, “Introduction,” describes the project background, purpose, and regulatory compliance.
- Chapter 2, “Project Description,” describes the project area, construction methods that will be employed, and the project features (i.e., environmental commitments) that have been incorporated into the project to avoid or reduce potential project effects.
- Chapter 3, “Environmental Setting and Impacts,” includes the initial study CEQA checklist. Components of the study include a setting discussion, description of project impacts and level of significance, and applicable mitigation measures.
- Chapter 4, “References Cited,” provides information on all printed references and personal communications used to prepare the initial study.
- Chapter 5, “List of Preparers,” presents an inventory of all those who assisted in the preparation of this document.
- Appendix A, “Mitigation Monitoring and Reporting Program,” provides a table of required mitigation that would be adopted as part of the proposed project. .
- Appendix B, “Air Quality and Climate Change Technical Appendix,” describes the modeling techniques used to estimate emissions associated with construction and operation of the proposed project.



## **Introduction**

This chapter describes the proposed project design, construction, and operation. It also includes a list of environmental commitments that would be implemented as part of the proposed project.

## **Project Location**

The project site is located in the north Delta in unincorporated Sacramento County at the divergence of the Sacramento River and Georgiana Slough, just downstream of Walnut Grove. Much of the area is rural, and riparian forest exists along much of the channels throughout the project area. However, industrial, commercial, residential, and agricultural land uses occur beyond the immediate channel banks. The specific project area consists of the land on the south bank of the Sacramento River at the west bank of Georgiana Slough at the divergence with Georgiana Slough (staging and loading areas) and the Sacramento River where the barrier structure would be installed (Figure 2-1).

## **Project Description**

The 2011 GSNPB Study is the installation and operation of a barrier using BAFF technology at the divergence of Georgiana Slough and the Sacramento River (Figure 2-1). The barrier is intended to create a behavioral deterrent for out-migrating juvenile salmonids to prevent entry to Georgiana Slough using sound, bubbles, and lights. In order to evaluate the efficacy of the barrier as a fish deterrent at this location, during barrier operation, a series of controlled releases of acoustically-tagged juvenile salmon smolts would be released at a selected location approximately 3 to 6 miles upstream of the barrier. Acoustic tag tracking systems would continuously monitor the area surrounding the barrier for fish presence, position, and passage through the area.

Barrier construction would begin mid- to late February 2011. Following installation, the barrier would be operated for up to 60 days, beginning after March 1, 2011. Upon completion of operation, the entire barrier structure and associated structures and equipment would be removed. Barrier removal would be complete by the end of May 2011. All disturbed areas will be restored to pre-project conditions.

## **Project Components**

### **Barrier Design**

The barrier employs the same technology that was used in 2009 and 2010 at the Head of Old River non-physical barrier, and which is planned for future development at that location. The barrier to be installed at the divergence of the Sacramento River and Georgiana Slough is a multi-stimulus fish barrier that combines high-intensity light-emitting diode (LED) Modulated Intense Lights (MILs), an

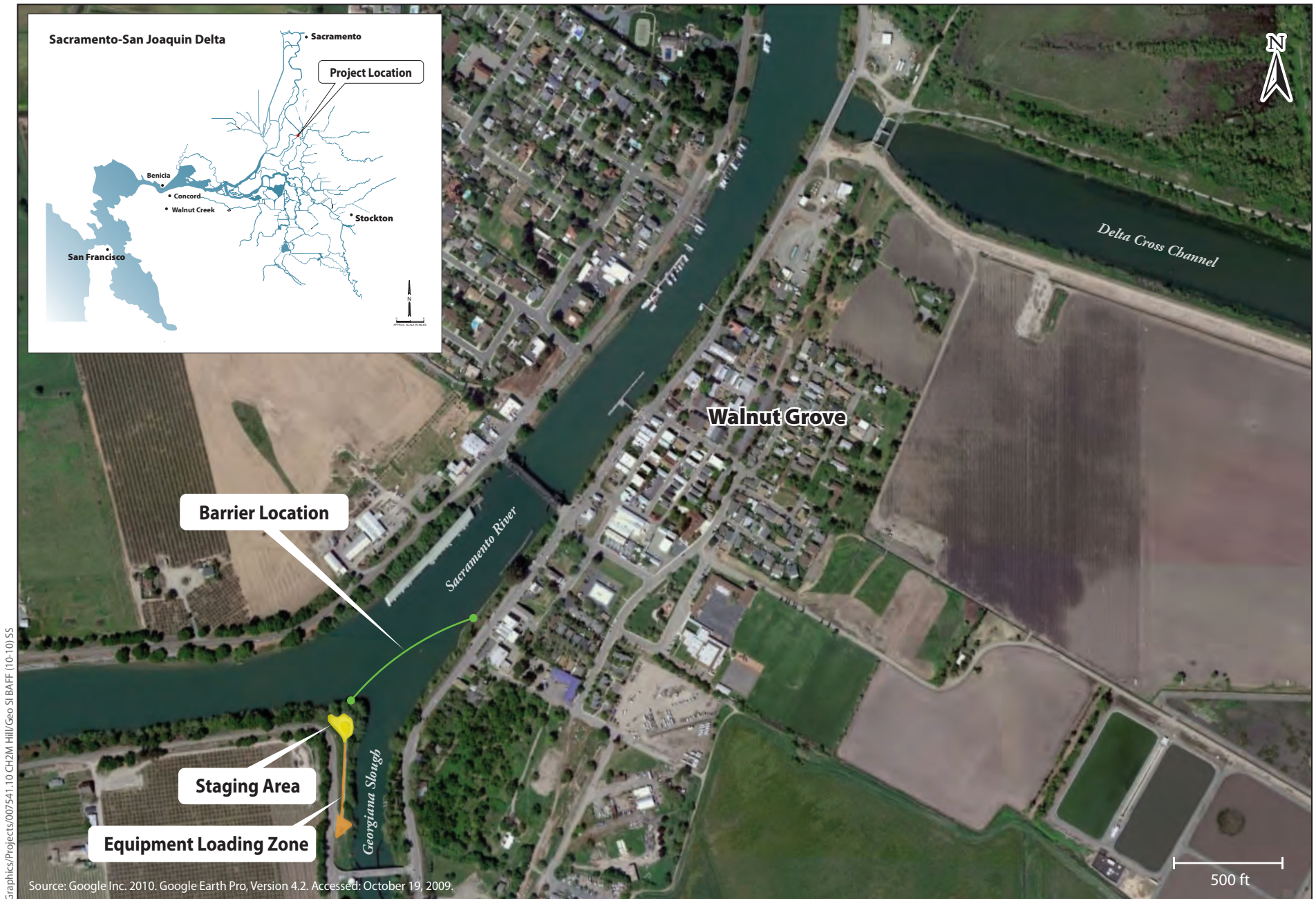
air bubble “curtain”, and sound at frequencies and levels that are repellent to Chinook salmon (Bowen et al. 2009; Bowen and Bark 2010). The sound system and MIL flash rate can be tuned to known sensitivities of various fish species. Investigations have indicated that the most effective acoustic deterrents for multiple fish species fall within the sound frequency range of 5 to 600 hertz (Hz) (Bowen and Bark 2010). Studies with Chinook salmon and delta smelt have shown that when the sound and strobe light flash rate were tuned according to these species’ sensitivities, the barrier was particularly effective as a deterrent for Chinook salmon smolts (Bowen et al. 2008). Based on these studies, it has been hypothesized that the sound is the deterrent. The sound is trapped by refraction within the bubble curtain, producing a sharply defined sound field that fish do not detect until within a few meters of the barrier. The flashing MILs are aligned such that the light beam projects onto the bubble curtain. This helps identify the bubbles so that the source of the sound can be determined by the fish. The narrow, vertical MIL beam minimizes light saturation within the experimental area.

The barrier would be approximately 700 feet long, comprised of 16 separate, approximately 39.4-foot frame sections. Each frame section would have approximately six sound projectors, 12 MILs, and a perforated “bubble” pipe (Figure 2-2). The bubble pipe would be positioned along each frame below and upstream of the sound projectors. A bubble curtain would be created by passing compressed air into the perforated pipe. Air flow rate would typically be 1.38 cubic feet per minute (cfm) per linear foot length of barrier. The MILs would be powered from an “accumulator” positioned on each frame section. A mounting plate would be attached to the support tray to house the accumulators. The junction of each frame section can pivot with the adjacent section, and where needed each frame section can be supported at either end with a piling or support column to a pier block. The frame sections could be adjusted vertically at the pile attachments to adjust for the uneven river bed contour. The sections would be positioned along the barrier line such that as much of the barrier as possible is at a depth where the high tide bubble curtain is less than 12 feet. In the main portion of the channel, this is approximately 12 feet from the channel bottom. The top of the frame sections will be at least 8 feet from the water surface elevation at low tide. The barrier frame would be supported by up to 20 piles in the river bed. Formed, streamlined concrete pier blocks may be used closer to the shore in shallower water to ensure the system remains in alignment.

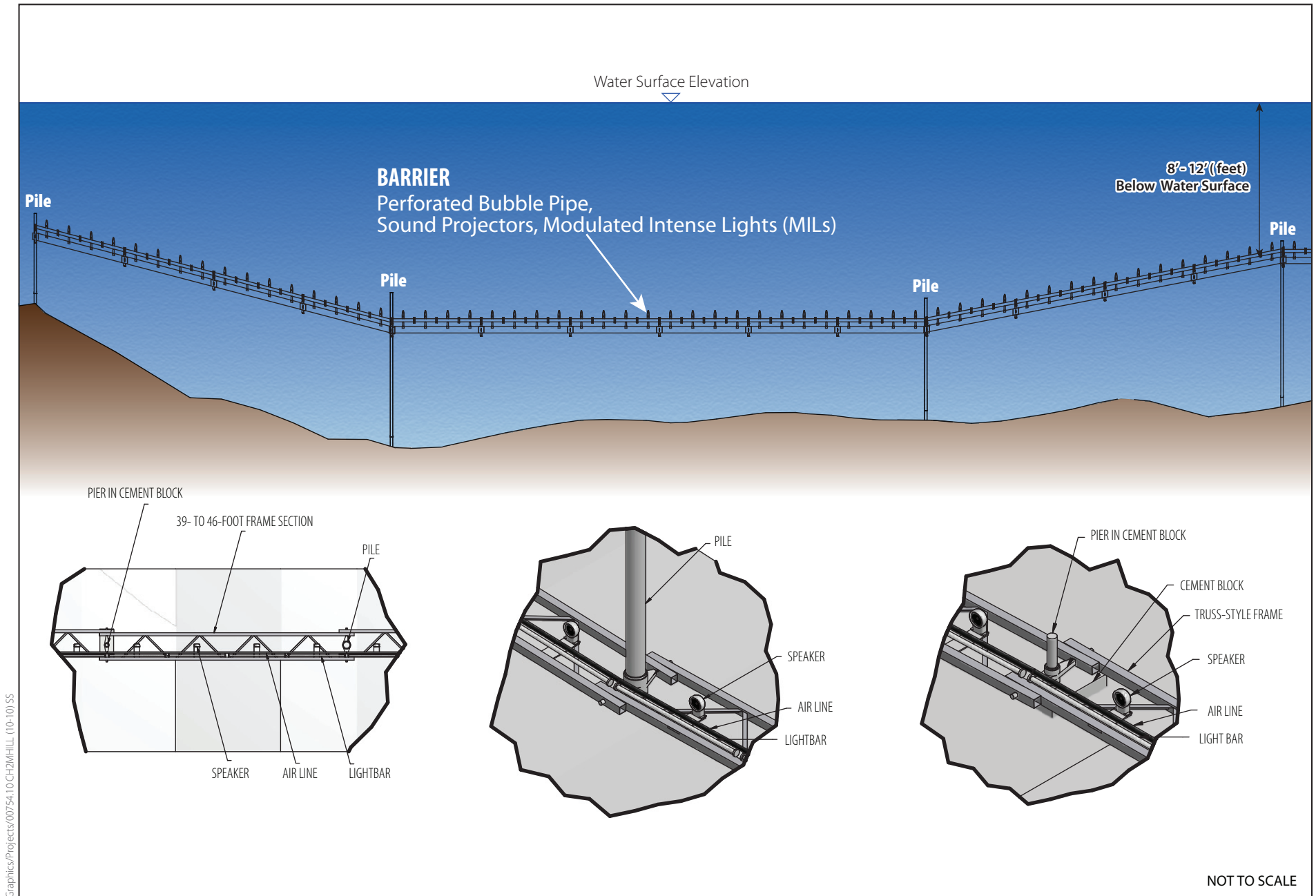
## Acoustic Telemetry Tracking System

The acoustic tag tracking system would consist of acoustic tags implanted in 1,000 to 1,500 juvenile Chinook salmon, underwater hydrophones, onshore receivers, data loggers, and data processing and storage computers. In addition, up to 75 predator fish (e.g., striped bass, catfish, and small mouth bass) would also be caught, tagged, released, and tracked throughout the study.

Each acoustic tag transmits an underwater sound signal (i.e., acoustic “ping”) that sends identification information about the tagged fish to the hydrophones. Up to 30 hydrophones would be deployed at specific locations in the vicinity of the Georgiana Slough barrier, both immediately upstream and downstream. The hydrophones would be deployed at various locations near the barrier to maximize spacing of the hydrophones to provide three-dimensional (3D) tracking. Hydrophones would also be deployed up to 2.5 miles downstream of divergence of the Sacramento River and Georgiana Slough in both Georgiana Slough and the Sacramento River in order to evaluate survival for those fish that pass or bypass the barrier. Additional hydrophones and data loggers would be deployed on the Sacramento River upstream of Georgiana Slough and at the mouth of Steamboat Slough. Each hydrophone would be connected by cable to a receiver. Hydrophones in the immediate vicinity of the barrier would be connected to multi-port receivers housed in the



**Figure 2-1**  
**Project Location**



Graphics/Projects/00754-10-CH2/WHILL (10-10) SS

**Figure 2-2**  
**Conceptual Georgiana Slough Barrier Design**

equipment trailer, and other hydrophones would be connected to individual receivers located in a small box on the bank of the waterway.

To deploy each hydrophone, it would be attached to a steel cable which is attached to a weight, which would be approximately 2 to 3 feet long by 8 inches wide, and the weight would be dropped to the bottom of the water column. A floating buoy is attached to the other end of the cable so that the cable is pulled tight between the weight and the buoy. The buoy may be floated on the water's surface, or it may be fixed at some distance below the water's surface so that there is no surface presence. Guy wires extending diagonally from the buoy to the bottom of the water column may be deployed to minimize hydrophone movement. Approximately 15,000 linear feet of hydrophone (communication) cable would be deployed.

## Visual Tracking System

A Dual-Frequency Identification Sonar (DIDSON) camera would be deployed immediately upstream of the barrier to regularly monitor fish behavior around the barrier. The camera would be placed in the water near the shore and origin point of the barrier. The DIDSON would record for 3 hours prior to and after the barrier is turned on or off, as well as during other times that visual tracking would benefit the study.

## Construction

Barrier construction would begin in mid- to late February. However, crews would first be deployed to the site for cleanup, minor site grading, and setup approximately 2 weeks prior to the beginning of barrier construction. These activities would require approximately 7 days. Site cleanup prior to barrier construction would consist of debris removal in the staging area, and minor clearing and grubbing of weeds located in the center of the staging area. In addition, the established foot pathway that runs from the staging area to the shore would be hand-pruned to allow for safe passage of construction crew to a floating dock. A dumpster will be onsite in the staging area for the duration of the proposed project; all trash will be disposed of by a dumpster service. During this site-preparation time, the barrier frames will be delivered and assembled on-site. In-water construction activities, including pile driving and frame installation, would take up to approximately 8 days. Construction equipment, such as a forklift, vibratory pile driver, and crane, would be operating for up to 7 days of the total approximate 2-week construction phase (includes barrier frame assembly and in-water construction activities). Construction activities would occur during daylight hours, up to 10 hours per day, 7 days per week. System startup and testing would require approximately 5 days.

The pile foundation and concrete pier block supports for the barrier frames would be installed first. Up to 20, 12-inch diameter, open-end steel pipe piles would be driven with a vibratory pile driver in the wetted channel from a barge. There would be no concrete/bentonite fill associated with the pile construction or installation. It is anticipated it would take approximately 30 minutes to 1 hour to position and load each pile and approximately 10 minutes to drive each pile approximately 25 feet into the river bed. Installation of all piles would require up to 2 days. The barrier frame sections would be assembled on land and would then be lowered into the water with the barge-mounted crane. Divers would attach the frame sets to the piles, and concrete pier blocks where necessary, and then attach the air lines and power cords to the barrier. Construction of the barrier would require the use of both on-shore and in-water equipment. It is anticipated that the following equipment would be used during construction and installation of the barrier: flatbed truck/trailer; tractor;

barge with spuds and tug; barge-mounted crane; vibratory pile driver; work boat; diesel generator; pickup trucks; fork lift; and an air compressor. The barge and workboat would be stored adjacent the shore by the staging area on either the Sacramento River or Georgiana Slough side based on whichever the barge contractor determines to be the safer location relative to boat traffic and navigation. To enable safe loading of construction personnel into the workboat, the contractor may place a floating dock (approximately 10 feet by 40 feet) near the shore at the existing foot path adjacent to the staging area.

Following the study, the barrier would be removed over a period of approximately 10 working days. Removal would be completed by the end of May 2011. The frame section, piles, underwater equipment, and all appurtenances would be removed from the water. The holes in the riverbed from the piles will not be filled. As indicated by a nearby soil boring log, the native geology will likely close in and self seal the holes as the piles are extracted. The piles would be removed with a barge-mounted crane. If necessary, very brief vibratory pile driving would be conducted to assist in pile extraction.

## Operation

Project operation would comply with the OCAP-required consideration of engineering solutions to further reduce diversion of emigrating juvenile salmonids to the interior and southern Delta (National Marine Fisheries Service 2009). Additionally, DWR will attempt to coordinate with other agencies' efforts to track fish movement in the Delta.

## Barrier Operation

A diesel generator with onsite backup would supply the power necessary to operate the barrier. The generator(s) would be located on a trailer(s) in the construction staging area, which occupies approximately 0.25 acres on the south bank of the Sacramento River at the west bank of Georgiana Slough. Additional trailer(s) would house the air compressor and a secure storage container would house the control units, signal generators, and amplifiers. One or more trailers containing real-time operations equipment (including telemetry equipment, interfaces, computers, office space, and sleeping quarters for staff conducting 24-hour monitoring) would also be located at the site. The trailers would be towed to and from the staging area and would not require the construction or improvements of any roads beyond minor gravel addition in the staging area to reduce pooling of rain water.

The barrier would be operated in conjunction with the release of acoustic-tagged fish beginning early to mid-March. To support the barrier monitoring study, the barrier would be turned on and off at specific times relative to these releases to collect data about fish deterrence of the barrier compared to conditions without the barrier. In addition, it is intended that the barrier would be "on" and "off" over a range of light and tidal conditions; two full tidal cycles are completed every 25 hours, and this period also covers the full range of light conditions.

# Environmental Commitments

The following environmental commitments would be implemented as part of the project to ensure minimization of impacts on sensitive environmental resources.

- **Install In-Water Signage.** Navigational buoys, lights, and signage will be installed in both the Sacramento River and Georgiana Slough up- and down-stream of the barrier to inform boaters of the presence of the barrier and maintain navigation along both waterways. DWR will coordinate with the U.S. Coast Guard on the positioning of signage and buoys.
- **Designate Noise Disturbance Coordinator.** Prior to construction, the construction contractor will notify residences within 500 feet of the construction areas of the construction schedule in writing. The construction contractor will designate a noise disturbance coordinator who will be responsible for responding to complaints regarding construction noise during the full term of construction. The coordinator will determine the cause of the complaint and will ensure that reasonable measures are implemented to correct the problem. A contact telephone number for the noise disturbance coordinator will be posted conspicuously on construction site fences and will be included in the written notification of the construction schedule sent to nearby residents. The noise disturbance coordinator will submit to Sacramento County a weekly summary of any noise complaints that have been received. The summary will include, but is not limited to, the name and location of the complainant, the nature of the complaint, and the action being taken to address the complaint.
- **Conduct Pile Driving with a Vibratory Driver.** DWR is committed to conducting all pile driving using a vibratory hammer to minimize to the extent possible the noise generated from pile-driving activities. Compared to the standard impact driving method, vibratory driving reduces the distance that noise exceeds NMFS thresholds by almost 1000 feet from the area of impact, substantially reducing or avoiding the potential to cause take of listed species.
- **Prepare and Implement an Erosion Control Plan.** An Erosion Control Plan will be implemented prior to construction activities that will cause ground disturbance. Site-specific erosion control, spill-prevention, and control of sedimentation and runoff measures would be developed and implemented as part of the plan.
- **Prepare and Implement a Hazardous Materials Management Plan.** A hazardous materials management plan (HMMP) will be prepared that identifies the hazardous materials to be used during construction; describes measures to prevent, control, and minimize the spillage of hazardous substances; describes transport, storage, and disposal procedures for these substances; and outlines procedures to be followed in case of a spill of a hazardous material. The HMMP will require that hazardous and potentially hazardous substances stored onsite be kept in securely closed containers located away from drainage courses, storm drains, and areas where stormwater is allowed to infiltrate. It will also stipulate procedures to minimize hazards during onsite fueling and servicing of construction equipment. Finally, the HMMP will require that adjacent land uses be notified immediately of any substantial spill or release.
- **Implement Turbidity Monitoring During Construction.** DWR will monitor turbidity levels in the Sacramento River and Georgiana Slough during ground-disturbing activities, including pile-driving. Monitoring will be conducted by measuring upstream and downstream of the disturbance area to determine if the change exceeds 20%, a threshold derived from the Sacramento and San Joaquin Rivers Basin Plan (Central Valley Regional Water Quality Control

Board 1998). If so, DWR contractors will adjust work to ensure that turbidity levels do not exceed the 20% threshold.

- **Implement Sacramento Metropolitan Air Quality Management District (SMAQMD) Basic and Enhanced Construction Emission Control Practices to Reduce Fugitive Dust and Exhaust.** The construction contractor will implement the following applicable basic and enhanced control measures to reduce construction-related fugitive dust and exhaust during site grading.

#### ***Basic Fugitive Dust Measures***

- Water all exposed surfaces two times daily, as needed. Exposed surfaces include, but are not limited to soil piles, graded areas, unpaved parking areas, staging areas, and unpaved access roads.
- Use wet power vacuum street sweepers to remove any visible trackout mud or dirt onto adjacent public roads at least once a day or as needed. Use of dry power sweeping is prohibited.
- Limit vehicle speeds on unpaved roads to 15 miles per hour (mph).
- Minimize idling time either by shutting equipment off when not in use or reducing the time of idling to 5 minutes (required by California Code of Regulations, Title 13, sections 2449[d][3] and 2485). Provide clear signage that posts this requirement for workers at the entrances to the site.
- Maintain all construction equipment in proper working condition according to manufacturer's specifications. The equipment must be checked by a mechanic and determined to be running in proper condition before it is operated.

#### ***Enhance Exhaust Measures***

- Acceptable options for reducing emissions may include use of late model engines, low-emission diesel products, alternative fuels, engine retrofit technology, after-treatment products, and other options as they become available.
- Ensure that emissions from the air compressor and generator do not exceed 40% opacity for more than 3 minutes in any 1 hour.
- Site the generator and air compressor at the farthest possible distance from the closest sensitive receptor. Doing so would reduce diesel particulate matter (DPM) concentrations at sensitive receptor locations.
- **Return Disturbed Areas to Pre-Project Conditions.** If riparian impacts are unavoidable or occur inadvertently, DWR will return the disturbed riparian habitat (0.01 acres) to pre-project conditions.
- **Monitor Adult Fish Response.** As part of the standard DIDSON monitoring for predatory fish that is undertaken in the 3 hours prior to and after the barrier is turned on or off, as well as during other times that visual tracking would benefit the study, observers will also examine the DIDSON output for signs of migrating adult Chinook salmon circling or congregating in the vicinity of the barrier for extended periods of time, i.e., greater than 1 hour. Should such behavior be observed while the barrier is operational, the barrier shall be switched off until the fish have dispersed.

- **Participate in a Worker Environmental Awareness Program.** Construction personnel will participate in a worker environmental awareness program that has been reviewed by NMFS, U.S. Fish and Wildlife Service (USFWS), and the California Department of Fish and Game (DFG). As part of this program, workers will be informed about the presence of the following species, which are protected under the ESA and/or CESA, and habitat associated with the species:
  - Winter-run Chinook salmon;
  - Spring-run Chinook salmon;
  - Central Valley steelhead;
  - North American green sturgeon southern DPS;
  - Delta smelt;
  - Longfin smelt; and
  - Swainson's hawk.

Workers will be informed that unlawful take of the animal or destruction of its habitat is a violation of the ESA and/or CESA. Prior to construction activities, a qualified biologist(s) approved by NMFS, USFWS, and DFG will instruct all construction personnel about the life history of the aforementioned species, and about the terms and conditions of the 2011 GSNPB Study biological opinions. Proof of this instruction will be submitted to all three agencies (i.e., NMFS, USFWS, and DFG).



## Chapter 3

# Environmental Setting and Impacts

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## Introduction

This chapter provides an overview of the existing physical environment and regulatory requirements for each of the resources that may be affected by the proposed project. The environmental setting is followed by an evaluation of the environmental impacts on each resource. The chapter is organized by resource topic and corresponds to the Environmental Checklist Form of the State CEQA Guidelines.

Implementing the mitigation measures specified in the impact analysis will either avoid adverse impacts completely or reduce the impacts to a less-than-significant level. Some impacts have been avoided by incorporating environmental commitments into the project description. DWR will adopt a Mitigation Monitoring and Reporting Program (MMRP) at the time it adopts the MND. The purpose of the plan is to ensure that the mitigation measures adopted as part of project approval will be implemented when the project is constructed. The MMRP is included in this document as Appendix A.

The following terminology is used to describe the level of significance of impacts:

- A finding of *no impact* is appropriate if the analysis concludes that the project would not affect the particular topic area in any way.
- An impact is considered *less than significant* if the analysis concludes that it would cause no substantial adverse change to the environment and requires no mitigation.
- An impact is considered *less than significant with mitigation incorporated* if the analysis concluded that it would cause no substantial adverse change to the environment with the inclusion of environmental commitments that have been agreed to by the applicant.
- An impact is considered potentially significant if the analysis concludes that it could have a substantial adverse effect on the environment, and mitigation is not possible.

## I. Aesthetics

| I. Aesthetics      |  | Potentially<br>Significant<br>Impact | Less-than-<br>Significant with<br>Mitigation<br>Incorporated | Less-than-<br>Significant<br>Impact | No<br>Impact             |
|--------------------|--|--------------------------------------|--|-------------------------------------|--------------------------|
| Would the project: |  |                                      |  |                                     |                          |
| a.                 | Have a substantial adverse effect on a scenic vista?   | <input type="checkbox"/>             | <input type="checkbox"/>                                     | <input checked="" type="checkbox"/> | <input type="checkbox"/> |
| b.                 | Substantially damage scenic resources, including, but not limited to, trees, rock outcroppings, and historic buildings along a scenic highway? | <input type="checkbox"/>             | <input type="checkbox"/>                                     | <input checked="" type="checkbox"/> | <input type="checkbox"/> |
| c.                 | Substantially degrade the existing visual character or quality of the site and its surroundings?   | <input type="checkbox"/>             | <input type="checkbox"/>                                     | <input checked="" type="checkbox"/> | <input type="checkbox"/> |
| d.                 | Create a new source of substantial light or glare that would adversely affect daytime or nighttime views in the area?                          | <input type="checkbox"/>             | <input type="checkbox"/>                                     | <input checked="" type="checkbox"/> | <input type="checkbox"/> |

## Introduction and Methods

The term *aesthetics* typically refers to the perceived visual character of an area, such as of a scenic view, open space, or architectural facade. The aesthetic value of an area is a measure of its *visual character* and *visual quality* combined with *viewer response* (Federal Highway Administration 1988). This combination may be affected by the components of a project (e.g., buildings constructed at a height that obstructs views, hillsides cut and graded, open space changed to an urban setting), as well as changing elements, such as light, weather, and the length and frequency of viewer exposure to the setting. Aesthetic impacts are changes in viewer response as a result of project construction and operation.

## Physical Setting

The project area is located in the rural area just south of Walnut Grove at the divergence of the Sacramento River and Georgiana Slough. Substantial riparian forest exists along much of the channels throughout the project area. However, industrial, commercial, residential, and agricultural land uses occur beyond the immediate channel banks. Viewer groups in this area include residents, drivers, and recreationists using the rivers. Approximately eight houses are located along the left bank of the Sacramento River and/or Georgiana Slough in the project area, with the closest being about 200 feet away from the project area. Additionally, there is a 550-foot boat slip on the right bank of the Sacramento River across from the proposed barrier site and a smaller boat slip/launch on the left bank of the Georgiana Slough approximately 400 feet from the Sacramento River and the proposed location of the barrier.

The primary roads in the project area include State Route (SR) 160 (located along the entire right bank of the Sacramento River), River Road (located on the left bank of the Sacramento River and

Georgiana Slough), and Andrus Island Road/Isleton Road, which curves around the right bank of the Georgiana Slough and left bank of Sacramento River. River Road and SR 160 are immediately adjacent to the channels in the project area, and Andrus Island Road/Isleton Road is removed from the banks, and views are blocked by thick riparian forests. SR 160 is also a designated State Scenic Highway and serves approximately 3,250 vehicles/day while River Road serves approximately 4,940 vehicles/day (Walnut Grove Area Chamber of Commerce 2010; California Department of Transportation 2009). Additionally, the Walnut Grove bridge, which connects SR 160 on the west with River Road on the east, is approximately 1,000 feet upstream of the proposed barrier location.

## Impacts and Mitigation Measures

- a. Would the proposed project have a substantial adverse effect on a scenic vista?*
- b. Would the proposed project substantially degrade scenic resources, including but not limited to, trees, rocks, outcroppings, and historic buildings along a scenic highway?*
- c. Would the proposed project substantially degrade the existing visual character or quality of the site and its surroundings?*

### Impact VIS-1: Temporary Changes in Views during Construction of the Barrier

Construction activities associated with the barrier will occur primarily in the Sacramento River, but would involve some land-based activities, including access to the site. Staging is expected to take place at the southern corner of the divergence of the Sacramento River and Georgiana Slough, in an area that is currently barren and located between the riparian forest on the channels and agricultural land uses to the east and south (Figure 2-1). In addition, a barge and workboat would be stored adjacent the shore by the staging area on either the Sacramento River or Georgiana Slough side based on whichever the barge contractor determines to be the safer location relative to boat traffic and navigation, and a floating dock (approximately 10 feet by 40 feet) may be placed near the shore at the existing foot path adjacent to the staging area. Viewer groups that would be affected by construction activities include motorists traveling on SR 160, River Road (including the Walnut Grove bridge), and Andrus Island Road/Isleton Road; boaters in the Sacramento River or Georgiana Slough; and those living or working adjacent to the channels. Construction, including site cleaning and setup, and removal phases are expected to take approximately 2 weeks and 10 days, respectively. In-water construction activities would take place over an approximate 8-day period. During the construction and removal phases, a few large pieces of construction equipment, including the barge, workboat, and floating dock, would be visible from roads, residences, and the river and temporarily would degrade the visual quality of the area. Minimal pruning of vegetation may be required to access the channel to install and remove the barrier, but no noticeable changes to the riparian forest would occur as a result of construction or removal. However, the largest viewer group affected would be motorists, and their views would be filtered by the riparian forests along the riverbanks and would be very temporary, lasting only moments as they travel through the area. Similarly, boaters in the area would pass the construction area quickly. Residents adjacent to the project site would experience temporary changes in the visual character of the river, but these would be limited to the short period of time necessary to construct and remove the barrier. Additionally, the primary use in the areas surrounding the project area is agricultural, which requires use of farm equipment that is similar in visual character to the equipment proposed for the construction and removal. As such, this impact is less than significant, and no mitigation is required.

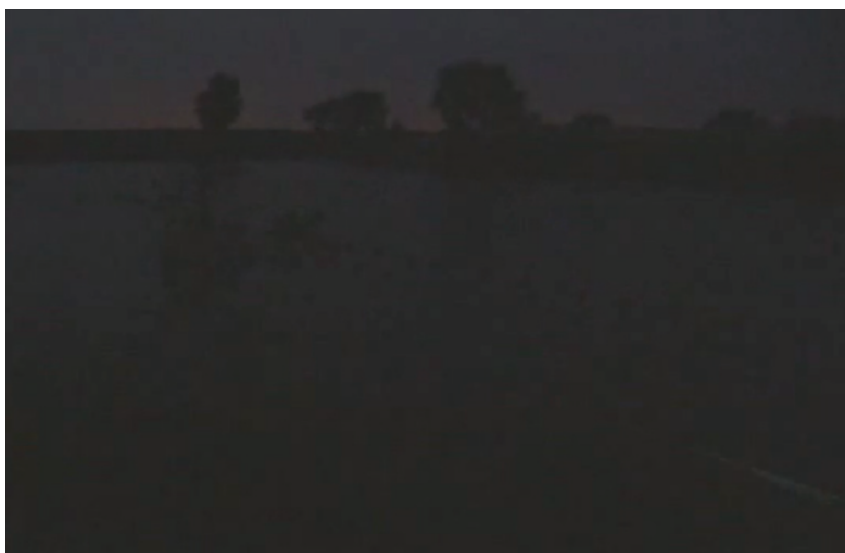
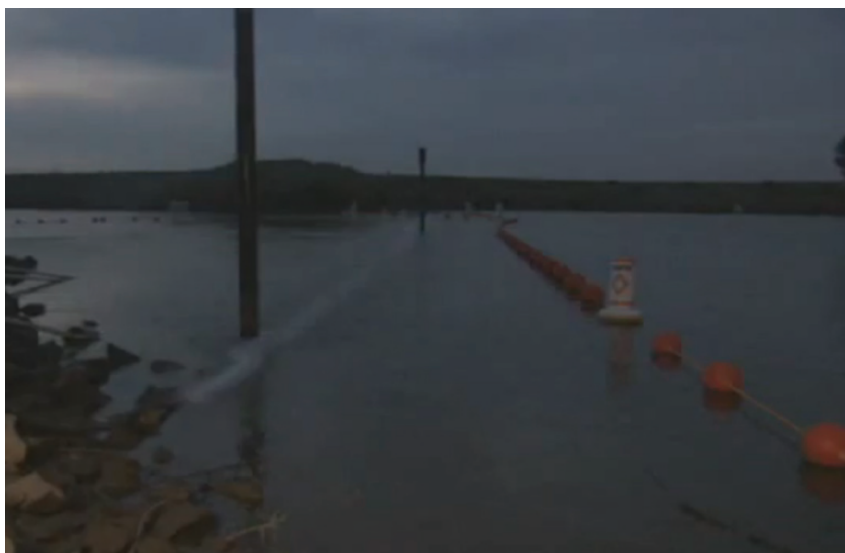
**Impact VIS-2: Temporary Changes in Views during Operation of the Barrier**

Operation of the barrier would not result in any substantial changes in the visual character or quality of the project area. A small, ¼-acre staging area would house operational equipment such as a trailer, generator, cables, and control panels, and the barrier structure itself would be located at least 8 feet from the water surface elevation at low tide. Buoys and in-water signage around the barrier would also be visible, but would be in place only during the period of project operation (less than 60 days). The staging area would be visible only to travelers on Andrus Island Road/Isleton Road, which is a small two-lane road adjacent to substantial agricultural operations. The temporary presence of the staging area equipment would result in minor changes in the visual character and quality of the area along this road. As such, this impact is less than significant, and no mitigation is required.

- d. Would the proposed project create a new source of substantial light or glare that would adversely affect daytime or nighttime views in the area?*

**Impact VIS-3: Temporary Changes in Nighttime Lighting in the Proposed Project Area during Operation of the Barrier**

The barrier includes strobe lighting that would be operated during some nighttime hours. Although the lighting would originate at least 8 feet below the water surface elevation at low tide, there is potential for travelers along the project area roads to notice the lights through the riparian forest separating them from the channels. Based on observations during the installation of a similar structure at the head of Old River in 2009 and 2010, and the lighting for the proposed barrier, it is not expected that there would be substantial changes in visible light (Figure 3-1). Observations at the head of Old River barrier concluded that nighttime lighting returned to ambient levels approximately 10 meters from the barrier. The turbid nature of the Sacramento River combined with the fast flows is expected to dissipate light emitted from the barrier, and the riparian forest would filter the views of it. Boaters in the project area would experience a new source of light during nighttime. However, this new source would occur sporadically throughout the night, would be limited to the immediate area of the barrier, and would be temporary (less than 60 days). As such, this impact is less than significant, and no mitigation is required.



Source: DWR 2009

**Figure 3-1**  
**Head of Old River Non-Physical Barrier Nighttime Light**



## II. Agricultural and Forestry Resources

| II. Agricultural and Forestry Resources   | Potentially Significant Impact | Less-than-Significant with Mitigation Incorporated | Less-than-Significant Impact | No Impact                           |
|---|--------------------------------|--|------------------------------|-------------------------------------|
| <p>In determining whether impacts on agricultural resources are significant environmental effects, lead agencies may refer to the California Agricultural Land Evaluation and Site Assessment Model (1997) prepared by the California Department of Conservation as an optional model to use in assessing impacts on agriculture and farmland. In determining whether impacts on forest resources, including timberland, are significant environmental effects, lead agencies may refer to information compiled by the California Department of Forestry and Fire Protection regarding the state's inventory of forest land, including the Forest and Range Assessment Project and the Forest Legacy Assessment Project, and forest carbon measurement methodology provided in the Forest Protocols adopted by the California Air Resources Board. Would the project:</p> |                                |  |                              |                                     |
| a. Convert Prime Farmland, Unique Farmland, or Farmland of Statewide Importance (Farmland), as shown on the maps prepared pursuant to the Farmland Mapping and Monitoring Program of the California Resources Agency, to non-agricultural use?  | <input type="checkbox"/>       | <input type="checkbox"/>                           | <input type="checkbox"/>     | <input checked="" type="checkbox"/> |
| b. Conflict with existing zoning for agricultural use or conflict with a Williamson Act contract?   | <input type="checkbox"/>       | <input type="checkbox"/>                           | <input type="checkbox"/>     | <input checked="" type="checkbox"/> |
| c. Conflict with existing zoning for, or cause rezoning of forest land (as defined in Public Resources Code Section 12220(g)), timberland (as defined by Public Resources Code Section 4526), or timberland zoned Timberland Production (as defined by Government Code Section 51104(g))?   | <input type="checkbox"/>       | <input type="checkbox"/>                           | <input type="checkbox"/>     | <input checked="" type="checkbox"/> |
| d. Result in the loss of forest land or conversion of forest land to non-forest use?  | <input type="checkbox"/>       | <input type="checkbox"/>                           | <input type="checkbox"/>     | <input checked="" type="checkbox"/> |
| e. Involve other changes in the existing environment that, due to their location or nature, could result in conversion of Farmland to non-agricultural use or conversion of forest land to non-forest use?  | <input type="checkbox"/>       | <input type="checkbox"/>                           | <input type="checkbox"/>     | <input checked="" type="checkbox"/> |

The proposed project is located in the Sacramento River south of Walnut Grove, in the heart of the Delta, where agricultural production is the primary land use. However, the barrier would be entirely in the Sacramento River and the small staging area, although under Williamson Act Contract, would not be located on land currently used for agriculture, and would be removed upon completion of the pilot study. Additionally, construction, removal, and operation of the barrier would not affect agricultural operations, and there are no forests located in or near the project area. As such, there would be no impacts on agricultural or forestry resources.

### III. Air Quality

| III. Air Quality   | Potentially<br>Significant<br>Impact | Less-than-<br>Significant with<br>Mitigation<br>Incorporated | Less-than-<br>Significant<br>Impact | No<br>Impact             |
|--|--------------------------------------|--|-------------------------------------|--------------------------|
| When available, the significance criteria established by the applicable air quality management or air pollution control district may be relied upon to make the following determinations. Would the project:   |                                      |  |                                     |                          |
| a. Conflict with or obstruct implementation of the applicable air quality plan?  | <input type="checkbox"/>             | <input type="checkbox"/>                                     | <input checked="" type="checkbox"/> | <input type="checkbox"/> |
| b. Violate any air quality standard or contribute substantially to an existing or projected air quality violation?   | <input type="checkbox"/>             | <input type="checkbox"/>                                     | <input checked="" type="checkbox"/> | <input type="checkbox"/> |
| c. Result in a cumulatively considerable net increase of any criteria pollutant for which the project region is a nonattainment area for an applicable federal or state ambient air quality standard (including releasing emissions that exceed quantitative thresholds for ozone precursors)? | <input type="checkbox"/>             | <input type="checkbox"/>                                     | <input checked="" type="checkbox"/> | <input type="checkbox"/> |
| d. Expose sensitive receptors to substantial pollutant concentrations?   | <input type="checkbox"/>             | <input type="checkbox"/>                                     | <input checked="" type="checkbox"/> | <input type="checkbox"/> |
| e. Create objectionable odors affecting a substantial number of people?  | <input type="checkbox"/>             | <input type="checkbox"/>                                     | <input checked="" type="checkbox"/> | <input type="checkbox"/> |

## Introduction and Methods

This section provides an analysis of air quality impacts resulting from the proposed project. It summarizes the overall regulatory framework for air quality management in California and the region, describes existing air quality conditions in the project area, identifies sensitive land uses, and discloses potential environmental impacts related to air quality. Greenhouse gas (GHG) emissions and climate change impacts are discussed below in Section VII.

## Physical Setting

### Regional Climate and Topography

The proposed project is located in the Sacramento Valley Air Basin (SVAB). Climate in the SVAB is characterized as Mediterranean. During the year the temperature may range from 20 to 115°Fahrenheit, with summer highs usually in the 90s and winter lows occasionally below freezing. Average annual rainfall is about 20 inches with about 75% occurring during the rainy season, generally from November through March. The prevailing winds are moderate in strength and vary from moist clean breezes from the south to dry land flows from the north.

The ozone (O<sub>3</sub>) season (May through October) in the Sacramento Valley is characterized by stagnant morning air or light winds with the Delta sea breeze arriving in the afternoon out of the southwest.

Usually the evening breeze transports the airborne pollutants to the north out of the Sacramento Valley. During about half of the days from July to September, however, a phenomenon called the Schultz Eddy prevents this from occurring. Instead of allowing the prevailing wind patterns to move north carrying the pollutants out, the Schultz Eddy causes the wind pattern to circle back south. Essentially this phenomenon causes the air pollutants to be blown south toward the Sacramento area. This phenomenon exacerbates the pollution levels in the area. The eddy normally dissipates around noon when the Delta breeze arrives.

## Air Quality Management

The air quality management agencies of direct importance in the project area are the U.S. Environmental Protection Agency (EPA), the California Air Resources Board (ARB), and the Sacramento Metropolitan Air Quality Management District (SMAQMD). The EPA and ARB have established national ambient air quality standards (NAAQS) and California ambient air quality standards (CAAQS), respectively, for the following six pollutants: carbon monoxide (CO), nitrogen dioxide (NO<sub>2</sub>), sulfur dioxide (SO<sub>2</sub>), O<sub>3</sub>, lead, and particulate matter (PM), which consists of PM less than 10 microns in diameter (PM<sub>10</sub>) and PM less than 2.5 microns in diameter (PM<sub>2.5</sub>). The ARB and the SMAQMD are responsible for ensuring that these standards are met. Table AQ-1 provides a summary of the NAAQS and CAAQS.

In addition to administration of air quality regulations developed at the federal and state levels, the SMAQMD is responsible for implementing local strategies for air quality improvement and recommending mitigation measures for new growth and development. Counties in the Sacramento area (Sacramento, Yolo, and portions of Placer, El Dorado, Solano, and Sutter) have adopted the 2009 Sacramento Regional 8-Hour Ozone Attainment and Reasonable Further Progress Plan (Ozone Plan). This plan outlines strategies to achieve the health-based ozone standard. The Sacramento region is also in the process of developing a plan to address PM. (Sacramento Metropolitan Air Quality Management District 2009b.)

In addition, the SMAQMD has established various rules and regulations to control air pollutant emissions. The following rules and regulations may be applicable to the proposed project:

- **Rule 402 Nuisance:** Prohibits the discharge of air containments that cause injury, detriment, nuisance, or annoyance.
- **Rule 404 Particulate Matter:** Limits the quantity of PM through concentration limits.
- **Rule 412 Stationary Internal Combustion Engines** (if construction requires engines rated at more than 50 break horsepower): Limits emissions of oxides of nitrogen (NO<sub>x</sub>), CO, and non-methane (CH<sub>4</sub>) hydrocarbons from stationary internal combustion engines.

**Table AQ-1. Air Quality Standards Applicable in California**

| Pollutant                    | Symbol                           | Average Time            | Standard (ppm) |          | Standard (µg/m <sup>3</sup> ) |          | Violation Criteria     |   |
|------------------------------|----------------------------------|-------------------------|----------------|----------|-------------------------------|----------|------------------------|---|
|                              |                                  |                         | California     | National | California                    | National | California             | National  |
| Ozone*                       | O <sub>3</sub>                   | 1 hour                  | 0.09           | NA       | 180                           | NA       | If exceeded            | NA  |
|                              |                                  | 8 hours                 | 0.070          | 0.075    | 137                           | 147      | If exceeded            | If fourth highest 8-hour concentration in a year, averaged over 3 years, is exceeded at each monitor within an area |
| Carbon monoxide              | CO                               | 8 hours                 | 9.0            | 9        | 10,000                        | 10,000   | If exceeded            | If exceeded on more than 1 day per year   |
|                              |                                  | 1 hour                  | 20             | 35       | 23,000                        | 40,000   | If exceeded            | If exceeded on more than 1 day per year   |
| (Lake Tahoe only)            |                                  | 8 hours                 | 6              | NA       | 7,000                         | NA       | If equaled or exceeded | NA  |
| Nitrogen dioxide             | NO <sub>2</sub>                  | Annual arithmetic mean  | 0.030          | 0.053    | 57                            | 100      | If exceeded            | If exceeded on more than 1 day per year   |
|                              |                                  | 1 hour                  | 0.18           | 0.100    | 339                           | 188      | If exceeded            | NA  |
| Sulfur dioxide               | SO <sub>2</sub>                  | 24 hours                | 0.04           | NA       | 105                           | NA       | If exceeded            | If exceeded on more than 1 day per year   |
|                              |                                  | 1 hour                  | 0.25           | 0.075    | 655                           | 196      | If exceeded            | NA  |
| Hydrogen sulfide             | H <sub>2</sub> S                 | 1 hour                  | 0.03           | NA       | 42                            | NA       | If equaled or exceeded | NA  |
| Vinyl chloride               | C <sub>2</sub> H <sub>3</sub> Cl | 24 hours                | 0.01           | NA       | 26                            | NA       | If equaled or exceeded | NA  |
| Inhalable particulate matter | PM10                             | Annual arithmetic mean  | NA             | NA       | 20                            | NA       | NA                     | NA  |
|                              |                                  | 24 hours                | NA             | NA       | 50                            | 150      | If exceeded            | If exceeded on more than 1 day per year   |
|                              | PM2.5                            | Annual arithmetic mean  | NA             | NA       | 12                            | 15       | NA                     | If 3-year average from single or multiple community-oriented monitors is exceeded                                   |
|                              |                                  | 24 hours                | NA             | NA       | NA                            | 35       | NA                     | If 3-year average of 98 <sup>th</sup> percentile at each population-oriented monitor within an area is exceeded     |
| Sulfate particles            | SO <sub>4</sub>                  | 24 hours                | NA             | NA       | 25                            | NA       | If equaled or exceeded | NA  |
| Lead particles               | Pb                               | Calendar quarter        | NA             | NA       | NA                            | 1.5      | NA                     | If exceeded no more than 1 day per year   |
|                              |                                  | 30-day average          | NA             | NA       | 1.5                           | NA       | If equaled or exceeded | NA  |
|                              |                                  | Rolling 3-month average | NA             | NA       | NA                            | 0.15     | If equaled or exceeded | Averaged over a rolling 3-month period  |

Source: California Air Resources Board 2010a.

Notes: ppm = parts per million; µg/m<sup>3</sup> = micrograms per cubic meter.

## Existing Air Quality Conditions

Existing air quality conditions in the project area can be characterized in terms of the NAAQS and CAAQS by monitoring data collected in the region. The nearest air quality monitoring station to the project area is the Elk Grove Bruceville Road monitoring station, which is located approximately 6.5 miles north of the project area. The Bruceville Road station monitors only for ozone and PM<sub>2.5</sub>. The next closest station monitoring for PM<sub>10</sub> and CO is the Bethel Island Station, which is approximately 17 miles south of the project area.

Air quality monitoring data from these stations are summarized in Table AQ-2. These data represent air quality monitoring data for the last 3 years (2007–2009) in which complete data are available.

As shown in Table AQ-2, the Elk Grove Bruceville Road monitoring station has experienced occasional violations of the state and federal ozone standards. The Bethel Island station experienced three violations of the state PM<sub>10</sub> standard in 2008.

**Table AQ-2. Air Quality Monitoring Data Measured at the Elk Grove Bruceville Road and Bethel Island Monitoring Stations**

| Pollutant Standards   | 2007  | 2008  | 2009  |
|---|-------|-------|-------|
| <b>1-Hour Ozone (Elk Grove Bruceville Road)</b>                   |       |       |       |
| Maximum 1-hour concentration (ppm)                                | 0.102 | 0.111 | 0.102 |
| Second-highest 1-hour concentration (ppm)                         | 0.092 | 0.107 | 0.098 |
| 1-hour California designation value                               | 0.11  | 0.11  | 0.10  |
| 1-hour expected peak day concentration                            | 0.109 | 0.105 | 0.099 |
| Number of days standard exceeded <sup>a</sup>                     |       |       |       |
| CAAQS 1-hour (>0.09 ppm)  | 1     | 5     | 2     |
| <b>8-Hour Ozone (Elk Grove Bruceville Road)</b>                   |       |       |       |
| National maximum 8-hour concentration (ppm)                       | 0.087 | 0.093 | 0.086 |
| National second-highest 8-hour concentration (ppm)                | 0.082 | 0.085 | 0.078 |
| State maximum 8-hour concentration (ppm)                          | 0.088 | 0.093 | 0.087 |
| State second-highest 8-hour concentration (ppm)                   | 0.083 | 0.085 | 0.079 |
| 8-hour national designation value                                 | 0.083 | 0.082 | 0.079 |
| 8-hour California designation value                               | 0.096 | 0.093 | 0.085 |
| 8-hour expected peak day concentration                            | 0.097 | 0.095 | 0.086 |
| Number of days standard exceeded <sup>a</sup>                     |       |       |       |
| NAAQS 8-hour (>0.075 ppm)   | 5     | 7     | 5     |
| CAAQS 8-hour (>0.070 ppm)   | 13    | 13    | 12    |
| <b>Carbon Monoxide (CO) (Bethel Island)</b>                       |       |       |       |
| National <sup>b</sup> maximum 8-hour concentration (ppm)          | 0.84  | 1.11  | 0.94  |
| National <sup>b</sup> second-highest 8-hour concentration (ppm)   | 0.79  | 0.87  | 0.91  |
| California <sup>c</sup> maximum 8-hour concentration (ppm)        | 0.84  | 1.11  | 0.94  |
| California <sup>c</sup> second-highest 8-hour concentration (ppm) | 0.79  | 0.87  | 0.91  |
| Maximum 1-hour concentration (ppm)                                | 1.1   | 1.0   | –     |
| Second-highest 1-hour concentration (ppm)                         | 1.0   | 0.9   | –     |

| Pollutant Standards   | 2007 | 2008 | 2009 |
|---|------|------|------|
| <b>Number of days standard exceeded<sup>a</sup></b>                                     |      |      |      |
| NAAQS 8-hour ( $\geq 9$ ppm)  | 0    | 0    | 0    |
| CAAQS 8-hour ( $\geq 9.0$ ppm)  | 0    | 0    | 0    |
| NAAQS 1-hour ( $\geq 35$ ppm)   | 0    | 0    | 0    |
| CAAQS 1-hour ( $\geq 20$ ppm)   | 0    | 0    | 0    |
| <b>Particulate Matter (PM<sub>10</sub>)<sup>d</sup> (Bethel Island)</b>                 |      |      |      |
| National <sup>b</sup> maximum 24-hour concentration ( $\mu\text{g}/\text{m}^3$ )        | 46.7 | 78.2 | 36.9 |
| National <sup>b</sup> second-highest 24-hour concentration ( $\mu\text{g}/\text{m}^3$ ) | 46.6 | 59.4 | 31.9 |
| State <sup>c</sup> maximum 24-hour concentration ( $\mu\text{g}/\text{m}^3$ )           | 49.4 | 77.0 | 39.1 |
| State <sup>c</sup> second-highest 24-hour concentration ( $\mu\text{g}/\text{m}^3$ )    | 49.1 | 61.0 | 33.0 |
| State annual average concentration ( $\mu\text{g}/\text{m}^3$ ) <sup>e</sup>            | 18.7 | 24.1 | –    |
| <b>Number of days standard exceeded<sup>a</sup></b>                                     |      |      |      |
| NAAQS 24-hour ( $> 150 \mu\text{g}/\text{m}^3$ ) <sup>f</sup>                           | 0    | 0    | 0    |
| CAAQS 24-hour ( $> 50 \mu\text{g}/\text{m}^3$ ) <sup>f</sup>                            | 0    | 3    | 0    |
| <b>Particulate Matter (PM<sub>2.5</sub>) (Elk Grove Bruceville Road)</b>                |      |      |      |
| National <sup>b</sup> maximum 24-hour concentration ( $\mu\text{g}/\text{m}^3$ )        | –    | –    | –    |
| National <sup>b</sup> second-highest 24-hour concentration ( $\mu\text{g}/\text{m}^3$ ) | –    | –    | –    |
| State <sup>c</sup> maximum 24-hour concentration ( $\mu\text{g}/\text{m}^3$ )           | 57.7 | 83.3 | 41.0 |
| State <sup>c</sup> second-highest 24-hour concentration ( $\mu\text{g}/\text{m}^3$ )    | 48.2 | 79.2 | 39.3 |
| National annual designation value ( $\mu\text{g}/\text{m}^3$ )                          | –    | –    | –    |
| National annual average concentration ( $\mu\text{g}/\text{m}^3$ )                      | –    | –    | –    |
| State annual designation value ( $\mu\text{g}/\text{m}^3$ )                             | –    | 16.1 | 14.7 |
| State annual average concentration ( $\mu\text{g}/\text{m}^3$ ) <sup>e</sup>            | –    | 16   | 16   |
| <b>Number of days standard exceeded<sup>a</sup></b>                                     |      |      |      |
| NAAQS 24-hour ( $> 35 \mu\text{g}/\text{m}^3$ )   | –    | –    | –    |

Sources: California Air Resources Board 2010b; U.S. Environmental Protection Agency 2010a.

Notes: CAAQS = California ambient air quality standards.  
NAAQS = national ambient air quality standards.  
ppm = parts per million.  
 $\mu\text{g}/\text{m}^3$  = micrograms per cubic meter.  
– = insufficient data available to determine the value.

<sup>a</sup> An exceedance is not necessarily a violation.  
<sup>b</sup> National statistics are based on standard conditions data. In addition, national statistics are based on samplers using federal reference or equivalent methods.  
<sup>c</sup> State statistics are based on local conditions data, except in the South Coast Air Basin, for which statistics are based on standard conditions data. In addition, state statistics are based on California approved samplers.  
<sup>d</sup> Measurements usually are collected every 6 days.  
<sup>e</sup> State criteria for ensuring that data are sufficiently complete for calculating valid annual averages are more stringent than the national criteria.  
<sup>f</sup> Mathematical estimate of how many days concentrations would have been measured as higher than the level of the standard had each day been monitored. Values have been truncated for presentation.

## Attainment Status

Areas are classified as either attainment or nonattainment with respect to state and federal air quality standards. These classifications are made by comparing actual monitored air pollutant concentrations to state and federal standards. If a pollutant concentration is lower than the state or federal standard, the area is classified as being in *attainment* of the standard for that pollutant. If a pollutant violates the standard, the area is considered a *nonattainment* area. If data are insufficient to determine whether a pollutant is violating the standard, the area is designated *unclassified*. Areas that previously were designated as nonattainment areas but have recently met the standard are called *maintenance* areas.

The EPA has classified Sacramento County as a serious nonattainment area for the federal 8-hour ozone standard, a nonattainment area for the federal PM<sub>2.5</sub> standard, and a moderate nonattainment area for the federal PM<sub>10</sub> standard. For the federal CO standard, the EPA has classified the Sacramento Urbanized Area as a moderate maintenance area (parts per million [ppm] >12.7), while the rest of the county is classified as an attainment/unclassified area (U.S. Environmental Protection Agency 2010b).

The ARB has classified Sacramento County as a serious nonattainment area for the state 1-hour ozone standard and a nonattainment area for the state 8-hour ozone, PM<sub>2.5</sub>, and PM<sub>10</sub> standards. The ARB has classified Sacramento County as an attainment area for the state CO standard (California Air Resources Board 2010c).

## Sensitive Receptors

The SMAQMD identifies sensitive receptors as “facilities that house or attract children, the elderly, people with illnesses or others who are especially sensitive to the effects of air pollutants.” Hospitals, schools, convalescent facilities, and residential areas are examples of sensitive receptors (Sacramento Metropolitan Air Quality Management District 2009a). The proposed project is located in the city of Walnut Grove, which borders the Sacramento River on both the east and west banks. Residences in the project area are located approximately 80 feet from the eastern bank of the Sacramento River. Walnut Grove Elementary School and SETA Head Start are located 0.25 mile northeast and 0.20 mile southeast of the divergence of Georgiana Slough and the Sacramento River, respectively. Four churches, Equipping Christian Center, Walnut Grove Community Presbyterian, St. Anthony, and Walnut Grove Buddhist Church, are within 0.50 mile of the proposed barrier.

## Impacts and Mitigation Measures

### Significance Criteria

Based on the State CEQA Guidelines Appendix G, an impact pertaining to air quality is considered significant if it would:

- conflict with or obstruct implementation of an applicable air quality management plan;
- violate any air quality standard or contribute substantially to an existing or projected air quality violation;
- result in a cumulatively considerable net increase of any criteria pollutant for which the project region is in nonattainment under an applicable NAAQS or CAAQS (including releasing emissions that exceed quantitative thresholds for ozone precursors);

- expose sensitive receptors to substantial pollutant concentrations; or
- create objectionable odors affecting a substantial number of people.

The guidelines further state that the significance criteria established by the applicable air quality management or air pollution control district may be relied on to make the determinations above. The SMAQMD has developed the significance criteria in their 2009 CEQA Guidelines (Sacramento Metropolitan Air Quality Management District 2009a). Consequently, the proposed project would have a significant impact on air quality if it would exceed any of the thresholds summarized in Table AQ-3.

**Table AQ-3. Summary of SMAQMD Thresholds**

| Pollutant       | Construction Phase  | Operational Phase |
|-----------------|---|-------------------|
| ROG             | –   | 65 pounds per day |
| NO <sub>x</sub> | 82 pounds per day   | 82 pounds per day |
| CO              | Exceed the CAAQS 1-hour or 8-hour standard  |                   |
| PM              | Exceed the CAAQS for PM <sub>10</sub> or disturb more than 15 acres per day and fail to implement emission control practices  |                   |
| TACs            | Result in an incremental increase in cancer risk higher than 10 in 1 million at any off-site receptor or result in a Hazard Index greater than 1 at any off-site receptor |                   |

Source: Sacramento Metropolitan Air Quality Management District 2009a.

ROG = reactive organic gas.

NO<sub>x</sub> = oxides of nitrogen.

CO = carbon monoxide.

PM = particulate matter.

TACs = toxic air contaminants.

***a. Would the proposed project conflict with or obstruct implementation of the applicable air quality plan?***

**Impact AQ-1: Conflict with Applicable Air Quality Plan or Regulation**

A project is deemed inconsistent with air quality plans if it would result in population and/or employment growth that exceeds growth estimates in the applicable air quality plan that, in turn, would generate emissions not accounted for in the applicable air quality plan emissions budget. Therefore, proposed projects need to be evaluated to determine whether they would generate population and employment growth and, if so, whether that growth would exceed the growth rates included in the relevant air plans.

The purpose of the proposed project is to install an acoustical fish barrier. It is neither population- nor growth-inducing and would not conflict with the planning assumptions in the Sacramento County General Plan. While the proposed project would generate relatively minor amounts of emissions associated with project operations and construction, these emissions are not expected to impede attainment or maintenance of the NAAQS or CAAQS by the SMAQMD. Consequently, the project would not conflict with or obstruct implementation of the applicable air quality plan. This impact is less than significant.

***b. Would the proposed project violate any air quality standard or contribute substantially to an existing or projected air quality violation?***

**Impact AQ-2: Generation of Criteria Pollutants during Project Construction or Operation**

**Construction**

Construction activities would generate short-term emissions of reactive organic gas (ROG), NO<sub>x</sub>, CO, PM<sub>10</sub>, and PM<sub>2.5</sub>. Generation of these emissions would result from the use of heavy equipment, such as cranes, and watercraft, such as tugboats. It was assumed that work crews would be on site approximately 2 weeks prior to construction to remove trash and debris. During this time, the barrier frames would be shipped upstream via barge. Minor site grading/gravel spreading would also take place during 1 day.

Table AQ-4 presents a summary of construction-related emissions. These emissions represent the maximum that would be generated in any one day. Detailed information on emission modeling and quantification methods may be found in Appendix B.

**Table AQ-4. Summary of Construction Emissions (pounds per day)**

| Phase                                      | ROG   | NO <sub>x</sub> | CO    | PM <sub>10</sub> |         |       | PM <sub>2.5</sub> |         |       |
|--|-------|-----------------|-------|------------------|---------|-------|-------------------|---------|-------|
|  |       |                 |       | Dust             | Exhaust | Total | Dust              | Exhaust | Total |
| Site prep and equipment delivery           | 37.68 | 55.76           | 13.85 | 0.01             | 1.40    | 1.41  | 0                 | 1.39    | 1.40  |
| Site grading/gravel spreading <sup>a</sup> | 0.44  | 3.34            | 2.18  | 20               | 0.2     | 20.2  | 4.18              | 0.18    | 4.36  |
| Barrier installation                       | 27.80 | 66.81           | 29.91 | 0.04             | 2.93    | 2.97  | 0.01              | 2.76    | 2.77  |
| Barrier removal                            | 27.80 | 66.81           | 29.91 | 0.04             | 2.93    | 2.97  | 0.01              | 2.76    | 2.77  |
| SMAQMD thresholds                          | –     | 85              | –     | – <sup>a</sup>   | –       | –     | – <sup>a</sup>    | –       | –     |
| Significant                                | N/A   | No              | N/A   | N/A <sup>a</sup> | N/A     | N/A   | N/A <sup>a</sup>  | N/A     | N/A   |

<sup>a</sup> Site grading will disturb no more than 1 acre.

<sup>b</sup> Exceedance of California Ambient Air Quality Standards, or failure to implement emissions control practices and disturb more than 15 acres per day.

ROG = reactive organic gas.

NO<sub>x</sub> = oxides of nitrogen.

CO = carbon monoxide.

PM = particulate matter.

TACs = toxic air contaminants.

SMAQMD = Sacramento Metropolitan Air Quality Management District.

Based on Table AQ-4, construction of the proposed project would not exceed the SMAQMD NO<sub>x</sub> threshold. The proposed project complies with the first criterion of the SMAQMD's fugitive dust screening threshold in that it will not disturb more than 15 acres per day. DWR will comply with the second criterion by implementing the environmental commitment in Chapter 2 addressing air quality emissions. As such, this impact is less than significant and no mitigation is required.

## Operations

Operational emissions would be generated by vehicle travel and operation of the generator and air compressor. Table AQ-5 presents a summary of operations-related emissions. These emissions represent the maximum that would be generated in any one day. Detailed information on emission modeling and quantification methods may be found in Appendix A.

**Table AQ-5. Summary of Operational Emissions (pounds per day)**

| Summary           | ROG  | NO <sub>x</sub> | CO   | PM10 | PM2.5 |
|-------------------|------|-----------------|------|------|-------|
| Project Emissions | 1.97 | 11.38           | 9.01 | 0.97 | 0.89  |
| SMAQMD Thresholds | 65   | 82              | –    | –    | –     |
| Significant?      | No   | No              | N/A  | N/A  | N/A   |

ROG = reactive organic gas.  
 NO<sub>x</sub> = oxides of nitrogen.  
 CO = carbon monoxide.  
 PM = particulate matter.  
 TACs = toxic air contaminants.  
 SMAQMD = Sacramento Metropolitan Air Quality Management District.

Based on Table AQ-5, operation of the proposed project would not exceed any of the SMAQMD significance thresholds. This impact is less than significant and no mitigation is required.

- c. Would the proposed project result in a cumulatively considerable net increase of any criteria pollutant for which the project region is nonattainment under an applicable federal, state, or regional ambient air quality standard (including releasing emissions which exceed quantitative thresholds for ozone precursors)?*

### **Impact AQ-3: Generation of Criteria Pollutants during Project Construction or Operation, Resulting in a Cumulative Air Quality Impact**

Implementation of the project would not create a significant air quality impact (discussed above under question b) following implementation the fugitive dust environmental commitment described in Chapter 2. Therefore, a no cumulatively considerable net increase of any pollutant would occur. This impact is considered less than significant and no mitigation is required.

- d. Would the proposed project expose sensitive receptors to substantial pollutant concentrations?*

### **Impact AQ-4: Generation of Diesel Particulate Matter Emissions during Project Construction or Operation, Resulting in an Increased Health Risk**

Diesel particulate matter (DPM), which is classified as a carcinogenic toxic air contaminant by the ARB, is the primary pollutant of concern with regard to health risks to sensitive receptors. Although diesel-powered equipment would operate at the project site, construction is anticipated to last only 7 days during installation and 10 days during removal, which is well below the recommended cancer risk assessment period of 70 years. Likewise, the operating period for the diesel-powered generator and air compressor, which would be less than 60 days, is well below the risk assessment timeframe. The environmental commitments in Chapter 2 addressing air emissions also will

substantially reduce the amount of DPM released into the surrounding area by these stationary sources. DPM levels therefore are expected neither to exceed the SMAQMD thresholds nor to result in increased health risks to any off-site receptor. This impact is considered less than significant and no mitigation is required.

*e. Create objectionable odors affecting a substantial number of people?*

**Impact AQ-5: Generation of Odors during Project Construction and Operations**

Diesel exhaust from construction activities and project operations may generate minor odors. However, once construction is completed and the barrier removed, these odors would cease. Moreover, odors generated by diesel exhaust are not likely to be noticeable beyond the immediate project area and therefore are not expected to be a nuisance at the closest sensitive receptor, which is 80 feet from the Sacramento River bank. This impact is considered less than significant.

## IV. Biological Resources

| IV. Biological Resources |   | Potentially<br>Significant<br>Impact | Less-than-<br>Significant with<br>Mitigation<br>Incorporated | Less-than-<br>Significant<br>Impact | No<br>Impact                        |
|--------------------------|---|--------------------------------------|--|-------------------------------------|-------------------------------------|
| Would the project:       |   |                                      |  |                                     |                                     |
| a.                       | Have a substantial adverse effect, either directly or through habitat modifications, on any species identified as a candidate, sensitive, or special-status species in local or regional plans, policies, or regulations, or by the California Department of Fish and Game or U.S. Fish and Wildlife Service? | <input type="checkbox"/>             | <input checked="" type="checkbox"/>                          | <input type="checkbox"/>            | <input type="checkbox"/>            |
| b.                       | Have a substantial adverse effect on any riparian habitat or other sensitive natural community identified in local or regional plans, policies, or regulations, or by the California Department of Fish and Game or U.S. Fish and Wildlife Service?   | <input type="checkbox"/>             | <input type="checkbox"/>                                     | <input checked="" type="checkbox"/> | <input type="checkbox"/>            |
| c.                       | Have a substantial adverse effect on federally protected wetlands as defined by Section 404 of the Clean Water Act (including, but not limited to, marshes, vernal pools, coastal wetlands, etc.) through direct removal, filling, hydrological interruption, or other means?                                 | <input type="checkbox"/>             | <input type="checkbox"/>                                     | <input checked="" type="checkbox"/> | <input type="checkbox"/>            |
| d.                       | Interfere substantially with the movement of any native resident or migratory fish or wildlife species or with established native resident or migratory wildlife corridors, or impede the use of native wildlife nursery sites?   | <input type="checkbox"/>             | <input type="checkbox"/>                                     | <input checked="" type="checkbox"/> | <input type="checkbox"/>            |
| e.                       | Conflict with any local policies or ordinances protecting biological resources, such as a tree preservation policy or ordinance?  | <input type="checkbox"/>             | <input type="checkbox"/>                                     | <input type="checkbox"/>            | <input checked="" type="checkbox"/> |
| f.                       | Conflict with the provisions of an adopted habitat conservation plan, natural community conservation plan, or other approved local, regional, or state habitat conservation plan?   | <input type="checkbox"/>             | <input type="checkbox"/>                                     | <input type="checkbox"/>            | <input checked="" type="checkbox"/> |

## Introduction

This section describes the biological resources present at the project area. Biological resources discussed in this section include vegetation and wildlife resources. The project area contains a mosaic of land cover types, including agricultural lands, riparian woodland and scrub, tidal perennial aquatic, ruderal vegetation, and developed lands. These land cover types support several common and special-status fish and wildlife species. The adjacent Sacramento River and Georgiana Slough channels support several special-status fish species. This section includes the following information:

- a summary of land cover types found in the project area and their importance to wildlife resources,
- a list of the special-status species that occur or may occur in the project area,
- a description of project effects on vegetation and wildlife resources, and
- measures to mitigate project-related impacts.

## Methods

Information on biological resources is based on a review of DFG's California Natural Diversity Data Base (CNDDB), a USFWS species list, and a site visit. The CNDDB search area included the U.S. Geological Survey (USGS) 7.5-minute quadrangle in which the project area is located (i.e., Isleton). Because the project site is located in the extreme northwest corner of the Isleton quadrangle, the three adjacent quadrangles were also included (i.e., Courtland, Bruceville, and Thornton). A USFWS species list was also obtained for the same quadrangles. The CNDDB and USFWS reports were generated on October 12, 2010. A site visit to assess terrestrial resources was performed on October 13, 2010.

In addition, information on fish was derived from a variety of sources cited in the text below. Further methods are provided in the text below.

## Physical Setting

### Land Cover Types

The project site is located at the divergence of the Sacramento River and Georgiana Slough. As described in Chapter 2, project activities will occur within the river and slough and at specific locations on the channel banks and adjacent uplands. The biological survey area for this project is shown in Figure 3-2. The survey area includes portions of the Sacramento River and Georgiana Slough, the channel banks adjacent to the river and slough, and adjacent uplands. Five land cover types were identified and mapped in the project area: open water, riparian, oak woodland, ruderal, and agricultural lands. In addition to the biological communities the project area contains developed areas. The locations of each land cover type within the study area are shown in Figure 3-2.

A DWR river bank stabilization project is located on the left bank of the Sacramento River and upstream of Georgiana Slough. Riprap was placed below the water surface elevation and on the lower channel bank. Fill soil was placed and graded to restore the channel bank and repair near vertical eroded channel banks. Riparian vegetation was planted on the reconstructed channel bank.

### Open Water

The project area is primarily open water within the Sacramento River. Rock armoring is present on portions of the channel banks and within the channel near the shoreline, including that described above. There are no in-channel emergent wetlands in the project area and there are no wetlands or other waters of the U.S. in adjacent uplands. Open water habitat provides cover and foraging areas for aquatic and water-dependent wildlife and native and nonnative fish.

### Riparian

Narrow bands of riparian habitat occur on the Sacramento River and Georgiana Slough channel banks. In most locations riparian vegetation extends from the summer water surface elevation to the

top of bank. There are 5.01 acres of riparian habitat in the project area. The riparian habitat is a mosaic of native riparian tree and shrub species. Depending on the location within the project area riparian habitat may be composed of a multi-layered canopy, dense thickets of riparian shrubs and small trees, or individual trees or clusters of trees with an herbaceous understory. The most common overstory in most of the project area is interior live oak (*Quercus agrifolia*). Other tree species include white alder (*Alnus rhombifolia*), cottonwood (*Populus fremontii*), and western sycamore (*Platanus racemosa*). Midstory tree and shrub species include narrow-leaved willow (*Salix exigua*), box elder (*Acer negundo*), and arroyo willow (*Salix lasiolepis*). The composition of understory species varies depending on location but include wild rose (*Rosa californica*), wild blackberry (*Rubus ursinus*), Himalayan blackberry (*Rubus discolor*), Santa Barbara sedge (*Carex barbarae*), Indian hemp (*Apocynum cannabinum*), and annual grasses and forbs.

Riparian habitat provides nesting, cover, and foraging areas for raptors, resident and migratory songbirds, and other wildlife.

### **Oak Woodland**

A narrow band of interior live oak trees is located on the south side of Andrus Island/Isleton Road. This land cover type is composed of a row of mature trees along the landside toe of the levee and an understory of annual grasses and forbs. This area was defined as oak woodland because it is located on the land side of the levee. There is 0.88 acre of oak woodland in the project area. Oak woodland provides nesting, cover, and foraging habitat for raptors, resident and migratory songbirds, and other wildlife.

### **Ruderal**

Ruderal habitat is composed of annual grasses, forbs, small shrubs, and vines. This land cover type occurs on portions of the channel banks and the Isleton Road embankment. There is 0.82 acre of ruderal habitat in the project area. Species commonly observed were wild rose, Himalayan blackberry, mare's tail (*Conyza canadensis*), and yellow star-thistle (*Centaurea solstitialis*). Ruderal habitat provides cover and foraging areas for resident and migratory songbirds and small mammals.

### **Agricultural Land**

Agricultural lands were not mapped because they occur outside of the areas that would be affected by the project. Agricultural lands in the vicinity of the project area include orchards, vineyards, and row crops.

### **Developed and Disturbed Areas**

Developed and disturbed areas in the project area are composed of paved and dirt roads. The paved roads in the project area are Andrus Island/Isleton Road, near the downstream limit of the project area, and River Road which runs through the town of Walnut Grove. A dirt road and turn around area is located on the levee at the south end of the project area. There is a building on the east channel bank of Georgiana Slough. There are 3.43 acres of developed and disturbed areas in the project area.

### **Special-Status Species**

Tables BIO-1, BIO-2, and BIO-3 list the special-status species with the potential to occur in the project area.



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**Figure 3-2**  
**Land Cover Types in the Project Area**



**Table BIO-1. Special-Status Wildlife Species with the Potential to Occur in the Project Area**

|   | Status <sup>1</sup> |   |  | Likelihood of Occurrence in the Project Area  | Proposed for Evaluation in the Initial Study |
|---|---------------------|---|--|---|--|
| Species Name  | Fed/State           | Distribution  | Habitat  |   |  |
| MAMMALS   |                     |   |  |   |  |
| Western red bat<br><i>Lasiurus blossevillii</i>     | –/CSC               | Central and coastal California  | Roosts in trees in forests or in scattered trees in grasslands   | Species observed in vicinity of the project area. Suitable habitat in the project area.                     | No   |
| BIRDS   |                     |   |  |   |  |
| Cooper’s hawk<br><i>Accipiter cooperii</i>          | /–                  | Throughout California except high altitudes in the Sierra Nevada. Winters in the Central Valley, southeastern desert regions, and plains east of the Cascade Range. | Nests in a wide variety of habitat types, from riparian woodlands and digger pine-oak woodlands through mixed conifer forests.                                     | Suitable habitat present in the project area.   | Yes  |
| Great blue heron (rookery)<br><i>Ardea herodias</i> | –/SB                | Common throughout most of California, less common mountains above the foothills.  | Occurs in shallow estuaries and fresh and saline emergent wetlands, ponds and other slow moving waterways. Nests in colonies in tops of large snags or live trees. | No rookery sites present in the project area.   | No   |
| Northern harrier<br><i>Circus cyaneus</i>           | /CSC                | Occurs throughout lowland California. Has been recorded in fall at high elevations.   | Grasslands, meadows, marshes, and seasonal and agricultural wetlands.  | No suitable habitat in the project area.  | No   |
| Snowy egret (rookery)<br><i>Egretta thula</i>       | –/SB                | Occurs in the Central Valley, coastal lowlands, on the northeastern plateau and in the Imperial Valley.   | Occurs in shallow estuaries and fresh and saline emergent wetlands, ponds and other slow moving waterways. Nests in colonies in tops of large snags or live trees. | No rookery sites present in the project area.   | No   |
| Swainson’s hawk<br><i>Buteo swainsoni</i>           | /CT                 | Lower Sacramento and San Joaquin Valleys, the Klamath Basin, and Butte Valley. Highest nesting densities occur near Davis and Woodland, Yolo County.                | Nests in oaks or cottonwoods in or near riparian habitats. Forages in grasslands, irrigated pastures, and grain fields.  | Species known to nest approximately 1 mile from project area. Suitable habitat present in the project area. | Yes  |

| Species Name   | Status <sup>1</sup> |   | Habitat  | Likelihood of Occurrence in the Project Area  | Proposed for Evaluation in the Initial Study |
|--|---------------------|---|--|---|--|
|  | Fed/State           | Distribution  |  |   |  |
| Tricolored blackbird<br><i>Agelaius tricolor</i>           | /CSC                | Permanent resident in the Central Valley from Butte County to Kern County. Breeds at scattered coastal locations from Marin County south to San Diego County; and at scattered locations in Lake, Sonoma, and Solano Counties. Rare nester in Siskiyou, Modoc, and Lassen Counties. | Nests in dense colonies in emergent marsh vegetation, such as tules and cattails, or upland sites with blackberries, nettles, thistles, and grainfields. Habitat must be large enough to support 50 pairs. Probably requires water at or near the nesting colony.  | No suitable habitat in the project area.      | No   |
| Western burrowing owl<br><i>Athene cunicularia hypugea</i> | /CSC                | Lowlands throughout California, including the Central Valley, northeastern plateau, southeastern deserts, and coastal areas. Rare along south coast.  | Level, open, dry, heavily grazed or low stature grassland or desert vegetation with available burrows.   | No suitable habitat in the project area.      | No   |
| White-tailed kite<br><i>Elanus leucurus</i>                | /FP                 | Lowland areas west of Sierra Nevada from the head of the Sacramento Valley south, including coastal valleys and foothills to western San Diego County at the Mexico border.   | Low foothills or valley areas with valley or live oaks, riparian areas, and marshes near open grasslands for foraging.   | Suitable habitat present in the project area. | Yes  |
| <b>REPTILES</b>  |                     |   |  |   |  |
| Giant garter snake<br><i>Thamnophis gigas</i>              | T/CT                | Central Valley from the vicinity of Burrell in Fresno County north to near Chico in Butte County; has been extirpated from areas south of Fresno.   | Sloughs, canals, low gradient streams and freshwater marsh habitats where there is a prey base of small fish and amphibians; also found in irrigation ditches and rice fields; requires grassy banks and emergent vegetation for basking and areas of high ground protected from flooding during winter. | No suitable habitat in the project area.      | No   |

| Species Name  | Status <sup>1</sup> |   | Habitat   | Likelihood of Occurrence in the Project Area       | Proposed for Evaluation in the Initial Study |
|---|---------------------|---|---|--|--|
|   | Fed/State           | Distribution  |   |  |  |
| Western pond turtle<br><i>Clemmys marmorata</i>                               | /CSC                | Northwestern subspecies occurs from the Oregon border of Del Norte and Siskiyou Counties south along the coast to San Francisco Bay, inland through the Sacramento Valley, and on the western slope of Sierra Nevada.<br>Southwestern subspecies occurs along the central coast of California east to the Sierra Nevada and along the southern California coast inland to the Mojave and Sonora Deserts; range overlaps with that of the northwestern pond turtle throughout the Delta and in the Central Valley. | Occupies ponds, marshes, rivers, streams, and irrigation canals with muddy or rocky bottoms and with watercress, cattails, water lilies, or other aquatic vegetation in woodlands, grasslands, and open forests.<br>Woodlands, grasslands, and open forests; aquatic habitats, such as ponds, marshes, or streams, with rocky or muddy bottoms and vegetation for cover and food. | Suitable habitat present in the project area.      | Yes  |
| <b>AMPHIBIANS</b>   |                     |   |   |  |  |
| California red-legged frog<br><i>Rana aurora draytonii</i>                    | T/CSC               | Found along the coast and coastal mountain ranges of California from Marin County to San Diego County and in the Sierra Nevada from Tehama County to Fresno County.   | Permanent and semipermanent aquatic habitats, such as creeks and cold-water ponds, with emergent and submergent vegetation. May aestivate in rodent burrows or cracks during dry periods.   | Outside the species known range                    | No   |
| California tiger salamander<br><i>Ambystoma californiense</i>                 | T/CSC               | Central Valley, including Sierra Nevada foothills, up to approximately 1,000 feet, and coastal region from Butte County south to northeastern San Luis Obispo County.   | Small ponds, lakes, or vernal pools in grass-lands and oak woodlands for larvae; rodent burrows, rock crevices, or fallen logs for cover for adults and for summer dormancy.  | No suitable habitat in the project area.           | No   |
| <b>INVERTEBRATES</b>  |                     |   |   |  |  |
| Valley elderberry longhorn beetle<br><i>Desmocerus californicus dimorphus</i> | T/-                 | Streamside habitats below 3,000 feet throughout the Central Valley.   | Riparian and oak savanna habitats with elderberry shrubs; elderberries are the host plant.  | No elderberry shrubs observed in the project area. | No   |

| Species Name   | Status <sup>1</sup> |  | Habitat  | Likelihood of Occurrence in the Project Area                                 | Proposed for Evaluation in the Initial Study |
|--|---------------------|--|--|--|--|
|  | Fed/State           | Distribution   |  |  |  |
| Valley elderberry<br>longhorn beetle critical<br>habitat<br><i>Desmocerus californicus<br/>dimorphus</i> |                     |  |  | Project area is not<br>within the area<br>designated as critical<br>habitat. | No   |
| Conservancy fairy shrimp<br><i>Branchinecta<br/>conservatio</i>  | E/-                 | Disjunct occurrences in Solano, Merced,<br>Tehama, Ventura, Butte, and Glenn<br>Counties.  | Large, deep vernal pools in annual<br>grasslands.                      | No suitable habitat<br>present in the project<br>area.                       | No   |
| Conservancy fairy shrimp<br>Critical habitat<br><i>Branchinecta<br/>conservatio</i>                      | E/-                 |  |  | Project area is not<br>within the area<br>designated as critical<br>habitat. | No   |
| Delta green ground beetle<br><i>Elaphrus viridis</i>   | T/-                 | Solano County  | Vernal pools in annual grasslands.                                     | No suitable habitat<br>present in the project<br>area.                       | No   |
| Delta green ground beetle<br>Critical habitat<br><i>Elaphrus viridis</i>                                 |                     |  |  | Project area is not<br>within the area<br>designated as critical<br>habitat. | No   |
| Vernal pool fairy shrimp<br><i>Branchinecta lynchi</i>   | T/-                 | Central Valley, central and south Coast<br>Ranges from Tehama County to Santa<br>Barbara County. Isolated populations<br>also in Riverside County. | Common in vernal pools; also found<br>in sandstone rock outcrop pools. | No suitable habitat<br>present in the project<br>area.                       | No   |
| Vernal pool fairy shrimp<br>critical habitat   |                     |  |  | Project area is not<br>within the area<br>designated as critical<br>habitat. | No   |
| Vernal pool tadpole<br>shrimp<br><i>Lepidurus packardi</i>   | E/-                 | Shasta County south to Merced County.  | Vernal pools and ephemeral stock<br>ponds.                             | No suitable habitat<br>present in the project<br>area.                       | No   |

| Species Name                                   | Status <sup>1</sup> |              | Habitat | Likelihood of Occurrence in the Project Area                        | Proposed for Evaluation in the Initial Study |
|--|---------------------|--------------|---------|---|--|
|  | Fed/State           | Distribution |         |   |  |
| Vernal pool tadpole<br>shrimp critical habitat |                     |              |         | Project area is not within the area designated as critical habitat. | No   |

Species listed in table are generated from the U.S. Fish and Wildlife Service (USFWS) project species list, California Department of Water Resources (DWR) field survey data, and California Natural Diversity Database (CNDDB) records. Species shown in highlight are species covered under the CALFED Bay-Delta Program (CALFED) programmatic biological opinions and the Natural Community Conservation Plan (NCCP) determination.

<sup>1</sup> Status:

**Federal**

- E = Listed as endangered under the federal Endangered Species Act (ESA).
- T = Listed as threatened under ESA.
- = No federal status.

**State**

- CE = Listed as endangered under the California Endangered Species Act (CESA).
- CT = Listed as threatened under CESA.
- CSC = California species of special concern.
- FP = Fully protected under California Fish and Game Code.
- SB = Specified birds under California Fish and Game Code.
- = No state status.

**Table BIO-2. Special-Status Plant Species with Potential to Occur in the Project Area**

| Species Name   | Status <sup>a</sup> |  | Distribution  | Preferred Habitats   | Period Identifiable | Likelihood of Occurrence in the Project Area  |
|--|---------------------|--|---|--|---------------------|---|
|  | Fed/State/Other     |  |   |  |                     |   |
| Suisun Marsh aster<br><i>Aster lentus</i>                                  | SC/-/1B             |  | Sacramento–San Joaquin Delta, Suisun Marsh, Suisun Bay, and Contra Costa, Napa, Sacramento, San Joaquin, and Solano Counties  | Tidal brackish and freshwater marsh: 0–10 feet; drainage and irrigation ditches                  | August–November     | Nearest CNDDDB record is upstream of project area near Delta Cross Canal gate. Marginal habitat in project area on channel banks. |
| Woolly rose-mallow<br><i>Hibiscus lasiocarpus</i> var. <i>occidentalis</i> | -/-/2               |  | Central and southern Sacramento Valley, deltaic Central Valley, and Butte, Contra Costa, Colusa, Glenn, Sacramento, San Joaquin, Solano, Sutter, and Yolo Counties                | Wet banks and freshwater marshes: generally sea level to 135 feet                                | August–September    | Nearest CNDDDB record is on Snodgrass Slough. No suitable habitat in the project area.  |
| Delta tule pea<br><i>Lathyrus jepsonii</i> var. <i>jepsonii</i>            | SC/-/1B             |  | Central Valley (especially the San Francisco Bay region) and Alameda, Contra Costa, Fresno, Marin, Napa, Sacramento, San Benito, Santa Clara, San Joaquin, and Solano Counties    | Coastal and estuarine marshes: sea level–15 feet; riverbanks and levees near the water's edge    | May–June            | Nearest CNDDDB record is on Snodgrass Slough. Marginal habitat in project area on channel banks.                                  |
| Mason's lilaeopsis<br><i>Lilaeopsis masonii</i>                            | SC/R/1B             |  | Southern Sacramento Valley, Sacramento–San Joaquin Delta, northeast San Francisco Bay area, and Alameda, Contra Costa, Marin*, Napa, Sacramento, San Joaquin, and Solano Counties | Freshwater and intertidal marshes and streambanks in riparian scrub: generally sea level–30 feet | April–October       | Nearest CNDDDB record is on Snodgrass Slough. Marginal habitat in project area on channel banks.                                  |
| Delta mudwort<br><i>Limosella subulata</i>                                 | -/-/2               |  | Contra Costa, Sacramento, San Joaquin, and Solano Counties; Oregon; Atlantic coast  | Intertidal marshes: sea level–10 feet  | May–August          | Nearest CNDDDB record is on Dead Horse Cut. No suitable habitat in the project area.  |
| Sanford's arrowhead<br><i>Sagittaria sanfordii</i>                         | SC/-/1B             |  | Scattered locations in Central Valley and Coast Ranges  | Freshwater marshes, sloughs, canals, and other slow-moving water habitats: sea level–1,850 feet  | May–August          | Nearest CNDDDB record is on North Fork Mokelumne River. No suitable habitat in the project area.                                  |

**Notes:**

CNDDDB = California Natural Diversity Database.

<sup>a</sup> Status

- = not listed.

**Federal**

SC = USFWS Species of Special Concern.

**State**

R = Listed as rare under California Native Plant Protection Act.

**Other**

California Native Plant Society (CNPS)

1B = CNPS List 1B—rare or endangered in California and elsewhere

2 = CNPS List 2—rare or endangered in California, more common elsewhere

**Table BIO-3. Special-Status Fish Species with the Potential to Occur in the Project Area**

| Species Name  | Status <sup>1</sup> |   | Habitat   | Likelihood of Occurrence in the Project Area  | Proposed for Evaluation in the Initial Study |
|---|---------------------|---|---|---|--|
|   | Fed/State           | Distribution  |   |   |  |
| Sacramento River Winter-Run Chinook Salmon ESU<br><i>Oncorhynchus tshawytscha</i>           | E/CE                | The mainstem Sacramento River and Battle Creek, as well as the San Francisco Estuary and Pacific Ocean. Upstream extent limited by impassable dams.   | Sacramento River, San Francisco Estuary, and ocean. | Project area is within designated critical habitat/essential fish habitat, is on the principal migratory route for adults and juveniles. Also a rearing area for juveniles. | Yes  |
| Central Valley Spring-Run Chinook Salmon<br><i>Oncorhynchus tshawytscha</i>                 | T/CT                | Several Sacramento River watershed streams while in freshwater (principally Butte Creek, Mill Creek, Deer Creek, Battle Creek, Feather River, Yuba River, and Clear Creek), San Francisco Estuary, and Pacific Ocean. Upstream extent limited by impassable dams. | Streams, mainstem rivers, estuaries, and ocean.     | Project area is within designated critical habitat/essential fish habitat; principal migratory route for adults and juveniles. Also a rearing area for juveniles.           | Yes  |
| Central Valley Fall-Run/Late-Fall Run Chinook Salmon ESU<br><i>Oncorhynchus tshawytscha</i> | SC/CSC              | California Central Valley, San Francisco Estuary, and Pacific Ocean. Upstream extent limited by impassable dams.  | Streams, mainstem rivers, estuaries, and ocean.     | Project area is within designated essential fish habitat; principal migratory route for adults and juveniles. Also a rearing area for juveniles.                            | Yes  |

| Species Name  | Status <sup>1</sup> |   | Habitat  | Likelihood of Occurrence in the Project Area  | Proposed for Evaluation in the Initial Study |
|---|---------------------|---|--|---|--|
|   | Fed/State           | Distribution  |  |   |  |
| Central Valley Steelhead<br>DPS<br><i>Oncorhynchus mykiss</i>   | T/-                 | California Central Valley, San Francisco Estuary, and Pacific Ocean. Principally in the Sacramento River watershed during the freshwater stages, but also in the San Joaquin watershed. Upstream extent limited by impassable dams. | Streams, mainstem rivers, estuaries, and ocean.  | Project area is within designated critical habitat; principal migratory route for adults and juveniles. Also a rearing area for juveniles.  | Yes  |
| Green Sturgeon,<br>Southern DPS<br><i>Acipenser medirostris</i> | T/-                 | South of the Eel River to around Point Conception, California. Only spawning population is in the Sacramento River.   | Nearshore ocean, estuaries, and larger rivers. Primarily benthic feeders.  | Project area is within designated critical habitat; principal migratory route for adults and juveniles. Also a rearing area for juveniles.  | Yes  |
| Delta Smelt<br><i>Hypomesus transpacificus</i>                  | T/T                 | Upper San Francisco Estuary, principally Suisun Bay and the Delta. Primarily downstream of Isleton (Sacramento River) and Mossdale (San Joaquin River) in the Delta.  | Shallow open waters of the estuary, typically 2–7 ppt salinity. Likely to spawn on hard substrates such as sand, gravel, or other submerged material.  | Project area is within designated critical habitat. Very low recent occurrence in the project area but appreciable numbers historically. Increased likelihood with decreasing river flow. | Yes  |
| Longfin Smelt<br><i>Spirinchus thaleichthys</i>                 | -/T                 | San Francisco Bay to Prince William Sound, Alaska. Rarely found upstream of Rio Vista on the Sacramento River and Medford Island on the San Joaquin River.  | Estuarine open waters, mid- to lower water column. Prefer salinity of 15–30 ppt salinity, except for spawning and early life stages when freshwater or low salinity is sought. Spawning over sandy or gravel substrate, rocks, and aquatic plants. | Very low recent occurrence in the project area but appreciable numbers historically. Increased likelihood with decreasing river flow.   | Yes  |
| Sacramento Splittail<br><i>Pogonichthys macrolepidotus</i>      | -/CSC               | Principally the Delta, Suisun Marsh, lower Napa River, lower Petaluma River; other parts of the San Francisco Estuary; but also Sacramento and San Joaquin Rivers and larger tributaries, as well as Sutter and Yolo Bypasses.      | Sloughs, lakes, and rivers. Estuaries up to 29 ppt salinity. Low to moderate current. Inundated vegetation for spawning.   | Likely based on historic occurrences.   | Yes  |

| Species Name  | Status <sup>1</sup> |   | Habitat  | Likelihood of Occurrence in the Project Area   | Proposed for Evaluation in the Initial Study |
|---|---------------------|---|--|--|--|
|   | Fed/State           | Distribution  |  |  |  |
| Starry Flounder<br><i>Platichthys stellatus</i>       | EFH/-               | Pacific coast from Santa Ynez River (Santa Barbara County) to Aleutian Islands (Alaska) and Bathurst Inlet (Canadian Arctic sea coast).   | Benthic habitats of brackish and occasionally freshwater parts of streams with extensive estuaries, as far as first riffle. Nearshore ocean.         | Possible, based on historic presence in Delta seine surveys near project area.                                 | Yes  |
| Northern Anchovy<br><i>Engraulis mordax</i>           | EFH/-               | Bays and estuaries from Baja California to Oregon.  | Bays, estuaries, and nearshore ocean. Pelagic portions of the water column.  | Unlikely but project area is at upper end of designated essential fish habitat.                                | Yes  |
| Pacific Lamprey<br><i>Entosphenus tridentata</i>      | SC/-                | Pacific coast streams from Hokkaido Island, Japan, to Rio Santo Domingo, Baja California.   | Streams, mainstem rivers, estuaries, and nearshore ocean.  | Likely based on historic occurrence, primarily during migration.   | Yes  |
| River Lamprey<br><i>Lampetra ayresi</i>               | -/CSC               | Large coastal streams from just north of Juneau, Alaska, to San Francisco Bay. Napa River, Sonoma Creek, Alameda Creek, other San Francisco Bay tributaries, lower Sacramento and San Joaquin Rivers and their tributaries. | Streams, mainstem rivers, estuaries, and nearshore ocean.  | Likely based on historic occurrence, primarily during migration.   | Yes  |
| Hardhead<br><i>Mylopharodon conocephalus</i>          | -/CSC               | Low- to mid-elevation streams in Sacramento-San Joaquin drainage and Russian River.   | Undisturbed areas of larger low- to mid-elevation streams and low elevations of Sacramento River and its tributaries to around 5,000 feet elevation. | Extremely rare occurrence in project area because project area is well downstream of normally inhabited areas. | No   |
| San Joaquin Roach<br><i>Hesperoleucas symmetricus</i> | -/CSC               | Sacramento and San Joaquin River drainages, except Pit River, as well as tributaries to San Francisco Bay.  | Small warm streams, but range from cool headwater reaches to warmwater lower reaches.  | No suitable habitat in the project area; never collected during USFWS seining in the Delta.                    | No   |
| Sacramento Perch<br><i>Archoplites interruptus</i>    | -/CSC               | Watersheds at elevations below 300 feet in Central Valley, Pajaro and Salinas Rivers, and Clear Lake.   | Formerly in sloughs, slow-moving rivers, and lakes; now mostly in reservoirs and farm ponds.   | Apparently almost entirely extirpated from the Delta.  | No   |

Species listed in table are generated from the California Department of Fish and Game Special Animals List (July 2009a). Distribution, habitat, and likelihood of occurrence from Moyle (2002), U.S. Fish and Wildlife Service (2008), and other sources cited in Chapter 3.

ppt = parts per trillion.

<sup>1</sup> Status:

**Federal**

- E = Listed as endangered under the federal Endangered Species Act (ESA).
- T = Listed as threatened under ESA.
- SC = Species of concern (NMFS or USFWS).
- EFH = Essential Fish Habitat designated (not listed as endangered or threatened).
- = No federal status.

**State**

- CE = Listed as endangered under the California Endangered Species Act (CESA).
  - CT = Listed as threatened under CESA.
  - CSC = California species of special concern.
  - = No state status.
-

## Special-Status Wildlife Species

Table BIO-1 lists the special-status wildlife species with the potential to occur in the project area.

### Swainson's Hawk

The Swainson's hawk (*Buteo swainsoni*) is a state-listed threatened species and is a migratory bird species protected under the Migratory Bird Treaty Act (MBTA). Swainson's hawk breeding range occurs from southwestern Canada to northern Mexico. Swainson's hawks are summer residents in the project area and small numbers of Swainson's hawks are known to winter in the Delta. In California, migrating Swainson's hawks return to nesting grounds and establish territories in March. The clutch is generally laid in early April to early May, but may occur later (California Department of Fish and Game 1994).

In the Central Valley, Swainson's hawks primarily nest in riparian areas adjacent to, or within easy flying distance to, agricultural fields or pastures, although isolated trees or roadside trees are sometimes used (California Department of Fish and Game 1994). Swainson's hawks nest in mature trees and the preferred tree species are valley oak, cottonwood, willows, sycamores, and walnuts. Nest sites are typically located within a few miles of suitable foraging areas but in some cases may be 10 miles or more from suitable foraging areas. The primary foraging areas for Swainson's hawk are open agricultural and pasture lands with alfalfa being the primary foraging land cover type (California Department of Fish and Game 1994).

There are 60 CNDDDB record of Swainson's hawks in the CNDDDB search area and 14 records within a 5-mile radius of the project area (California Natural Diversity Database 2010). There is one nest site record on Georgiana Slough approximately 1 mile south of the project area. Other potentially suitable nest trees are present in the project vicinity and also within ¼ mile of the project area. Although there is no Swainson's hawk foraging habitat in the project area, there is suitable foraging habitat in the vicinity of the project area that provide suitable foraging habitat.

### White-Tailed Kite

The white-tailed kite (*Elanus leucurus*) is a state fully protected species. White-tailed kites inhabit open lowland grassland, riparian woodland, marshes, and scrub areas in Central Valley and coastal valleys and foothills. The white-tailed kite is a permanent resident in the project area. White-tailed kites typically breed in open country with scattered trees. Large shrubs or trees are required for nesting. Nest sites are often located near water. The white-tailed kite breeding season extends from February through October with the peak of the nesting occurring between May through August. Communal night roosting is common during the non-breeding season. Open space areas and agricultural fields in the vicinity of the project area provide potential foraging habitat.

There is one CNDDDB records of white-tailed kite in the CNDDDB search area (California Natural Diversity Database 2010). This nest site is approximately 6.50 miles northwest of the project area. Potential white-tailed kite nesting and roosting habitat exists in riparian and oak woodland habitat in the project area and in other similar habitat in the project vicinity. Surrounding agricultural lands and open space areas provide suitable foraging habitat.

## Cooper's Hawk

The Cooper's hawk (*Accipiter cooperii*) is a California species of concern and is a migratory bird species protected under the MBTA. Cooper's hawk breeds throughout most of California in a variety of woodland habitats, including riparian and oak woodlands (Zeiner et al. 1990). Cooper's hawk also nest and forage in urban and suburban areas where mature trees are present. The Cooper's hawk breeding season typically extends from March through August with the peak of the nesting occurring between May through July.

Cooper's hawk primarily feed on birds but also take small mammals, reptiles, and amphibians. Although Cooper's hawks have not been recorded in the project area (California Natural Diversity Database 2010) they are expected to be permanent residents in the project area because riparian habitat along the Sacramento River and other waterways in the project vicinity provides nesting, roosting, and foraging habitat. Wintering and migrating Cooper's hawks may also occur in the project area.

## Western Pond Turtle

The western pond turtle (*Clemmys marmorata*) is a California species of concern. Western pond turtle inhabits permanent or nearly permanent waters with little or no current (Behler and King 1998). The channel banks of inhabited waters usually have thick vegetation, but basking sites, such as logs, rocks, or open banks, must also be present (Zeiner et al. 1988). Eggs are laid in nests along sandy banks of large, slow-moving streams or in upland areas, including grasslands, woodlands, and savannas. The western pond turtle nesting season is from March through August.

There are 16 CNDDDB records of western pond turtle in the CNDDDB search area (California Natural Diversity Database 2010). The nearest recorded occurrence is on the Mokelumne River approximately two miles east of the project area. In the project area western pond turtle may occur in the Sacramento River and Georgiana Slough. These waterways provide suitable foraging and escape cover for western pond turtle and suitable nesting substrate occurs in some of the adjacent uplands.

## Special-Status Plant Species

Table BIO-2 lists the special-status plant species with the potential to occur in the project area.

### Suisun Marsh Aster

Suisun Marsh aster (*Aster lentus*) is a federal species of concern and is listed by the California Native Plant Society (CNPS) as a List 1B species. Suisun Marsh aster is a perennial herb that occurs in brackish and freshwater marsh habitat along tidal sloughs and rivers, usually at or near the water's edge, or in drainage and irrigation ditches.

There are 4 CNDDDB records of Suisun Marsh aster in the CNDDDB search area (California Natural Diversity Database 2010). The nearest recorded occurrence is near the gate of the Delta Cross Canal just east of the Sacramento River. This occurrence is approximately 0.75 mile upstream of the project area. This species was not observed in the project area during the October 2010 site visit. The dense stands of riparian vegetation on the channel banks and shoreline and bare areas due to heavy pedestrian traffic provide limited habitat potential for this species.

## Delta Tule Pea

Delta tule pea (*Lathyrus jepsonii* var. *jepsonii*) is a federal species of concern and is listed by CNPS as a List 1B species. Delta tule pea is a perennial herb that occurs along tidal sloughs, riverbanks, and levees near the water's edge. Some populations are partially inundated at high tide (California Department of Water Resources 1994).

There are 11 CNDDDB records of Delta tule pea in the CNDDDB search area (California Natural Diversity Database 2010). The nearest recorded occurrence is approximately 1.75 miles northeast of the project area on Snodgrass Slough. There are no records of this species on the Sacramento River or Georgiana Slough in the project vicinity. This species was not observed in the project area during the October 2010 site visit. The dense stands of riparian vegetation on the channel banks and shoreline and bare areas due to heavy pedestrian traffic provide limited habitat potential for this species.

## Mason's Lilaeopsis

Mason's lilaeopsis (*Lilaeopsis masonii*) is a federal species of concern, is listed as a rare plant under the California Native Plant Protection Act, and is listed by CNPS as a List 1B species. Mason's lilaeopsis is a diminutive rhizomatous perennial herb that typically occurs on clay or silt tidal mudflats with high organic matter content (Golden and Fiedler 1991).

There are 5 CNDDDB records of Mason's lilaeopsis in the CNDDDB search area (California Natural Diversity Database 2010). The nearest recorded occurrence is approximately 2 miles northeast of the project area on Snodgrass Slough. There are no records of this species on the Sacramento River or Georgiana Slough in the project vicinity. This species was not observed in the project area during the October 2010 site visit. Tidal mudflats were not observed in the project area and dense stands of riparian vegetation on the channel banks and shoreline shade the shoreline and limit the likelihood of this species establishing in the project area. Also, the shoreline in portions of the project area, particularly the downstream access point, is subject to heavy pedestrian traffic that has resulted in pathways and other bare areas on the bank at this location, which provide limited habitat potential.

## Special-Status Fish Species

Table BIO-3 lists the special-status fish species with the potential to occur in the project area.

### Chinook Salmon

Sacramento River winter-run Chinook salmon are state- and federally listed as endangered. Central Valley spring-run Chinook salmon are state- and federally listed as threatened. Critical habitat is designated for winter-run and spring-run Chinook and includes the project area. Central Valley fall/late fall-run Chinook salmon are a federal species of concern and a state species of special concern.

Adult Chinook salmon 2–7 years old migrate from the ocean to spawn in the upstream reaches of the major tributaries to the Sacramento and San Joaquin Rivers and in the upper mainstem Sacramento River. Eggs are deposited in gravel nests and fry emerge after incubating for about 2 months (Moyle 2002). Juvenile salmon migrate from upstream spawning areas to downstream habitats and to the ocean.

The Delta serves as an immigration path and holding area for adult Chinook salmon returning to their natal rivers to spawn. Sacramento River Chinook salmon migrate primarily up the mainstem Sacramento River, but some fish use the distributaries of the Mokelumne River and enter the Sacramento River through Georgiana Slough or the Delta Cross Channel. San Joaquin River Chinook salmon migrate primarily up the mainstem San Joaquin River.

Adult Central Valley fall-run Chinook salmon begin moving through the Delta to the Sacramento and San Joaquin Rivers in late August or early September, and peak spawning occurs in late October and November (Myers et al. 1998). Spring-run Chinook salmon return to the Sacramento River in March through July and spawn in late August through October. Spring-run Chinook salmon apparently have been extirpated from the San Joaquin River watershed (Myers et al. 1998), and wild populations are currently found only in Mill, Deer, and Butte Creeks in the Sacramento River watershed. Sacramento winter-run Chinook salmon have a life cycle unique to the species in that spawning occurs in late spring and summer. Adults move through the Delta and into the Sacramento River from November to June and spawn from late April to mid-summer.

Emigrating juvenile Chinook salmon are found in the Delta and Bay throughout the year, but primarily from October through June. Migration along the fastest and most direct migration route generally results in the highest survival of Chinook salmon migrating to the ocean through the Delta. Relatively low survival is found for fish migrating through the interior Delta (e.g., Georgiana Slough or the Delta Cross Channel) (Brandes and McLain 2001; Perry et al. 2010).

Juveniles of all three listed races of Chinook salmon and Central Valley steelhead may be found in the vicinity of the project area during construction and operation of the barrier (National Marine Fisheries Service 2009a; Table BIO-4). Construction, operation, and removal of the barrier encompasses the period from mid- to late February through late May. The percentage of juvenile Sacramento River-watershed salmonids entering the Delta at this time ranges from 57% (winter-run Chinook salmon) to 96% (spring-run Chinook salmon) (Table BIO-4).

**Table BIO-4. Percentage of Juvenile Sacramento River-watershed Salmonids Entering the Delta by Month**

| Month     | Fall-Run | Spring-Run | Winter-Run | Sacramento Steelhead |
|-----------|----------|------------|------------|----------------------|
| January   | 14       | 3          | 17         | 5                    |
| February  | 13       | 0          | 19         | 32                   |
| March     | 23       | 53         | 37         | 60                   |
| April     | 6        | 43         | 1          | 0                    |
| May       | 26       | 1          | 0          | 0                    |
| June      | 0        | 0          | 0          | 0                    |
| July      | 0        | 0          | 0          | 0                    |
| August    | 1        | 0          | 0          | 0                    |
| September | 0        | 0          | 0          | 1                    |
| October   | 9        | 0          | 0          | 0                    |
| November  | 8        | 0          | 3          | 1                    |
| December  | 0        | 0          | 24         | 1                    |

Source: National Marine Fisheries Service 2009a: 633 (OCAP BO).

Adult winter-run, spring-run, and late fall-run Chinook salmon, as well as Central Valley steelhead, may migrate upstream through the project area towards spawning areas during the construction and operation of the barrier (Table BIO-5). For winter-run Chinook salmon, February to April is the main period of upstream migration and encompasses around 75% of the run, with an additional 10% migrating upstream in May (Table BIO-5; Vogel and Marine 1991). The data in Table BIO-5 refer to passage above Red Bluff Diversion Dam because detailed data do not exist for passage through the Delta; assuming an upstream migration rate of 25 km/day (see Williams [2006] for a range of migration rates), the adult salmonids would have passed through the Delta approximately 2 weeks before reaching Red Bluff.

**Table BIO-5. Percentage of Adult Chinook Salmon Passing Above Red Bluff Diversion Dam By Month**

| Month     | Fall-Run | Late Fall-Run | Spring-Run | Winter-Run |
|-----------|----------|---------------|------------|------------|
| January   | 0        | 17.5          | 0          | 3.75       |
| February  | 0        | 17.5          | 0          | 13.75      |
| March     | 0        | 6.25          | 1.25       | 37.5       |
| April     | 0        | 1.25          | 1.25       | 25         |
| May       | 0        | 0             | 4.5        | 10         |
| June      | 0        | 0             | 10.5       | 7          |
| July      | 2.5      | 0             | 15         | 1.5        |
| August    | 10       | 0             | 25         | 1.5        |
| September | 32.5     | 0             | 27.5       | 0          |
| October   | 40       | 20            | 15         | 0          |
| November  | 12.5     | 17.5          | 0          | 0          |
| December  | 2.5      | 20            | 0          | 0          |

Source: Adapted from Vogel and Marine (1991), averaging wet and dry years and assuming midpoints for values denoted as 'greater than' or 'less than' by Vogel and Marine (1991).

## Central Valley Steelhead

Central Valley steelhead are federally listed as threatened and the project area is included within their designated critical habitat. Central Valley steelhead are classified as winter-run with peak adult migration through the Delta occurring in September through February (Busby et al. 1996). Spawning typically occurs from December to April in higher gradient and elevation streams and rivers. A significant portion of steelhead, in contrast to anadromous salmon, spawn more than once with adults returning to the ocean and reentering the Delta to spawn in Central Valley tributaries.

Most Central Valley steelhead spend two years in fresh water (Busby et al. 1996) and emigrate through the Delta in late winter and spring. Initially, juvenile steelhead are found in or near their natal spawning streams. As they grow and mature, juvenile steelhead may move downstream into larger stream segments, including the mainstem Sacramento River. By the time juvenile steelhead reach the Delta they are migratory and move through the Delta and into marine areas relatively quickly. Steelhead typically spend two years in the ocean prior to returning to spawn in freshwater. California steelhead, however, have a higher proportion of 1-year ocean fish compared to more northern populations (Busby et al. 1996).

Central Valley streams that presently support steelhead include upper Sacramento River, Mill, Deer, and Butte Creeks, and the Feather, Yuba, American, Mokelumne, Calaveras, and Stanislaus Rivers (McEwan 2001). Steelhead may have been extirpated from the San Joaquin River watershed (Moyle 2002). Although the existence of natural-origin steelhead in the San Joaquin watershed is controversial (McEwan 2001; Williams 2006), there are several lines of evidence to suggest a small self-sustaining population (McEwan 2001).

McEwan (2001) describes peak steelhead upstream migration as occurring from September to March, although the species has a protracted migration and holding period that encompasses much of the year (National Marine Fisheries Service 2009a: Table 4-6 of OCAP BO). Most juvenile steelhead downstream migration through the Delta occurs in February and March (Table BIO-4).

### **Southern DPS of North American Green Sturgeon**

Green sturgeon are federally listed as threatened and are a state species of special concern. The project area is within the species' designated critical habitat. Green sturgeon are anadromous, spawning in fresh water in the Central Valley and returning to San Francisco Bay and nearshore marine waters to feed and mature. Adult sturgeon have been reported as far upstream as Red Bluff on the Sacramento River (Moyle 2002). Spawning occurs in the spring in deep, fast water. Females produce 60–140,000 eggs that are broadcast and fertilized over cobble substrate (Moyle 2002). Juveniles migrate to sea after 1–3 years in estuarine waters. Adults are largely marine and migrate considerable distances along the Pacific Coast. Adults sexually mature after 13 to 20 years and then spawn every 2–5 years (Adams et al. 2007).

There are insufficient quantitative data from which to assess the percentage of green sturgeon within the project area during construction and operation of the barrier. Adult green sturgeon may be present in the San Francisco Bay-Delta from March to September, with the principal occurrence in upstream spawning areas in the Sacramento River occurring from mid-April to mid-June (National Marine Fisheries Service 2009a: Table 4-7 of OCAP BO). Older juveniles (between 10 months and 3 years old) may be present in the Sacramento-San Joaquin Delta year-round (National Marine Fisheries Service 2009a: Table 4-7 of OCAP BO). Juvenile green sturgeon are routinely collected at the SWP and CVP salvage facilities throughout the year (National Marine Fisheries Service 2009a). Salvage records indicate that sub-adult green sturgeon may be present in the Delta during any month of the year in low numbers, but are most commonly salvaged in July and August; these fish range in size from 136 millimeters (mm) to 744 mm (National Marine Fisheries Service 2009a).

### **Delta Smelt**

Delta smelt are listed as threatened by the state and federal governments. The project area is included in the species' designated critical habitat. Delta smelt are found throughout the Delta and are most abundant where salinity is generally less than 2 parts per trillion (ppt) (56 FR 50075). Delta smelt adults disperse widely into fresher water in late fall and winter as the spawning period approaches, moving as far upstream as Mossdale on the San Joaquin River and the confluence with the American River on the Sacramento River. Spawning occurs in fresh water over sandy or gravel substrates from February through June and may peak during late April and early May (Wang 1991; Sweetnam and Stevens 1991; Stevens et al. 1990; U.S. Fish and Wildlife Service 2008). Most adult (1-year-old) delta smelt die after spawning (56 FR 50075). Although rare, two-year-old female

spawners may be important to the population because of their relatively high fecundity (Bennett 2005).

After the eggs hatch (in about 12–14 days), delta smelt larvae typically float to the surface and are carried by the currents (Stevens et al. 1990). Under natural outflow conditions, the larvae are carried downstream to near the upstream edge of the entrapment zone (2-ppt salinity), where they typically remain and grow to adult size. A proportion of the population may remain close to natal areas throughout the life cycle (Sommer et al. 2009)

The general temporal occurrence of delta smelt in the Delta is described in the USFWS (2008) OCAP BO. Adults migrate upstream to spawn from December to March, with larvae and early juveniles subsequently present from March to June (U.S. Fish and Wildlife Service 2008). Occurrence of spawning and therefore presence of adults in the general project vicinity was suggested by Wang (1991). The distribution of delta smelt in the project area is at present very low, with the main population center during the construction and operation period of the barrier generally occurring in the Cache Slough/Sacramento Deep Water Ship Channel Complex (U.S. Fish and Wildlife Service 2008). Intensive Kodiak trawling during earlier Georgiana Slough experimental acoustical fish barrier studies (Hanson et al. undated) in 1994 yielded 76 delta smelt (U.S. Fish and Wildlife Service 1998), probably reflecting the species' greater abundance at that time.

To explore further the potential exposure of the species to the construction and operation of the barrier, Spring Kodiak trawl survey data (California Department of Fish and Game 2010) were examined to ascertain the recent relative abundance of adult delta smelt in the project vicinity. This survey consists of around 40 stations sampled during winter and spring for adult smelt during the spawning period. Station 724, Sacramento River at Ryde Hotel, is just under 4 km downstream of the divergence of Georgiana Slough and has been sampled between January and May since 2004. A single delta smelt was collected at this location from a total of 27 trawls conducted during this period, in March 2005; the total number of delta smelt collected at all stations in March 2005 was 250. The overall number of delta smelt collected in the Spring Kodiak trawl surveys between 2005 and 2010 has ranged from 335 in 2008 to 1442 in 2010. Therefore the project area seems to be at the periphery of the species' present range.

## Longfin Smelt

Longfin smelt are state-listed as threatened. Except when spawning, longfin smelt are most abundant in Suisun and San Pablo Bays, where salinity generally ranges between 2 ppt and 20 ppt (Natural Heritage Institute 1992). Longfin smelt migrate upstream to the Delta and spawn in fresh water primarily during February through April (Natural Heritage Institute 1992). The eggs are adhesive and probably are deposited on sand, gravel, rocky substrate, or aquatic plants (Moyle 2002).

Eggs hatch in 37–47 days at 45°F (Dryfoos 1965). Larval abundance in the Bay-Delta estuary peaks during January–March (California Department of Fish and Game 2009b). Shortly after hatching, a longfin smelt larva develops a gas bladder that allows it to remain near the water surface, a feature that is not possessed by delta smelt (Wang 1991). Larvae are swept downstream into nursery areas in the western Delta and Suisun and San Pablo Bays (Baxter et al. 1999 cited by Moyle 2002: 236).

Adult longfin smelt generally migrate upstream for spawning in freshwater as temperatures drop in the fall, from November onwards (Moyle 2002; Baxter et al. 2009). Larvae and early juveniles are

subsequently found in upstream areas from January until early spring when they migrate downstream (Moyle 2002; Baxter et al. 2009).

No longfin smelt were collected during Spring Kodiak trawling from 2005–2010 at station 724, just downstream of Georgiana Slough. Longfin smelt total catch at all stations in the Delta over the 2005–2010 period ranged from 10 in 2006 to 1810 in 2008. No longfin smelt were collected at the nearest stations to the project area during the precursor to the Spring Kodiak trawling, i.e., winter-spring midwater trawling from December to March, and the species' center of abundance is typically over 25 miles downstream near the confluence of the Sacramento and San Joaquin Rivers (Baxter et al. 2009). Nevertheless, adult and juvenile longfin smelt are occasionally collected in the vicinity of the project area and further upstream, generally between the months of December and May, and larvae were collected in the Sacramento River near Georgiana Slough during 1992–1994 (California Department of Fish and Game 2009b). Upstream occurrence is greatest during years with low Sacramento River flows (California Department of Fish and Game 2009b).

### **Sacramento Splittail**

Sacramento splittail is a state species of special concern. Sacramento splittail are freshwater fish capable of tolerating moderate levels of salinity (10–18 ppt) (59 FR 862). Splittail are confined largely to the Delta, Suisun Bay, Suisun Marsh, and Napa Marsh and, outside of the spawning season, are rarely found more than 5–10 miles above the upstream boundaries of the Delta (Moyle et al. 1989; Natural Heritage Institute 1992). Spawning runs, however, are more extensive, with major spawning and nursery areas in the Yolo and Sutter Bypasses and riparian areas on the lower Cosumnes River during years of high runoff when floodplains are inundated (Sommer et al. 1997, 2001; Crain et al. 2004). Incidental catches of large splittail in fyke traps set by DFG in the lower Sacramento River during spring indicate that splittail migrate from Suisun Bay, the Delta, and the lower river reaches to upstream spawning habitats.

Splittail spawn adhesive eggs over flooded streambanks or aquatic vegetation when water temperatures are between 9°C and 20°C (Moyle 2002; Wang 1986). Spawning has been observed to occur as early as January and to continue through July (Wang 1986). Peak spawning occurs during March through May. Larval splittail are commonly found in the shallow, weedy areas where spawning occurs. Larvae eventually move into deeper, open-water habitats as they grow and become juveniles (Wang 1986).

Occurrence of splittail in the project area during construction and operation of the barrier is possible, Sommer et al. (1997) found young-of-the-year splittail were most abundant in the North Delta (Clarksburg to lower Grand Island) in two out of five years sampled. However, abundance of young-of-the-year is generally greatest in late spring/early summer (May–June), i.e., after the period of barrier operation is scheduled to finish. It is more likely that adults or juveniles would be found.

### **Pacific Lamprey**

Pacific lamprey is a federal species of concern. Adult Pacific lampreys spend 6 months to 3.5 years in the marine environment (Beamish 1980 and Kan 1975, both cited by Brostrom et al. 2010: 5) and return to freshwater mostly during spring and summer months (Brostrom et al. 2010). They may spend up to 1 year in freshwater habitat usually holding until the following spring in low-velocity areas under large boulders and bedrock crevices, before spawning. Adults observed in freshwater range in size from 350 mm to 650 mm (Beamish 1980 cited by Brostrom et al. 2010: 5). Adult lampreys generally spawn between March and July in gravel bottom streams, usually at the

upstream end of riffle habitat near suitable habitat for ammocoetes larvae, and die after spawning (Beamish 1980 cited by Brostrom et al. 2010: 5). Low to moderate gradient stream reaches with a mix of silt and cobble substrate may offer optimal spawning and rearing habitat (Brostrom et al. 2010). Streams and rivers with low-velocity natural flows, particularly in low-gradient reaches, are important characteristics associated with lamprey presence (Kostow 2002 cited by Brostrom et al. 2010: 5). The incubation period is 18-49 days (Brumo 2006 cited by Brostrom et al. 2010: 5) and ammocoetes drift downstream to areas of low stream velocity and burrow into sand or silt substrate.

Ammocoetes are mostly sedentary, remaining burrowed in the stream substrate for 3 to 7 years and filter feeding on algae, diatoms, and detritus (Brostrom et al. 2010). Depositional areas with soft substrate near stream margins associated with pools, alcoves and glides are where most ammocoetes burrow (Graham and Brun 2007 cited by Brostrom et al. 2010: 5). Ammocoetes move downstream during high flow events or if disturbed and metamorphose at around 100 mm into the sub-adult form (macrophthalmia), generally from July through November, depending on distance from salt water (Brostrom et al. 2010).

Outmigration to the ocean occurs during or shortly after transformation (Beamish 1980 cited by Brostrom et al. 2010: 5). Out-migration generally peaks with rising stream and river flows in late winter or early spring (Kostow 2002 cited by Brostrom et al. 2010: 5). Most downstream movements occur at night (Gritsenko 1968; Brostrom et al. 2010: 5). The onset of parasitism in Pacific lampreys occurs during metamorphosis and can occur before entering saltwater (Richards and Beamish 1981 cited by Brostrom et al. 2010: 5). Little is known of their offshore life. Adults in saltwater feed on a variety of marine and anadromous fish, and are preyed upon by sharks, sea lions, birds, and other marine mammals (69 FR 77158 cited by Brostrom et al. 2010: 5).

Recent monitoring of materials dredged in the Delta at Rio Vista, downstream of the project area, have found low densities of lamprey (SWCA 2009). Sampling of Pacific lamprey by midwater trawling upstream and downstream of the project area in Suisun Bay and at Sherwood Harbor (Sacramento River) reveals that most adult lamprey are found from April to June and juveniles are mostly collected from December to February (Hanni et al. 2006).

## **River Lamprey**

River lamprey is a state species of special concern. River lamprey is thought to occur throughout Pacific coast streams, but its occurrence in California includes tributaries of San Francisco Bay, such as the Napa River, Sonoma Creek, and Alameda Creek, as well as the Sacramento, San Joaquin, and Russian Rivers (Moyle et al. 1995; Moyle 2002). Although river lamprey are believed to be in decline, the exact status of this species is uncertain. Currently, very little information describing the abundance and distribution of river lamprey is available, perhaps largely in part because the species is often overlooked and seldom studied.

Limited information is available regarding the life history of this species in California. Current accounts are based largely on information from Canadian populations (Moyle 2002). River lamprey is a semelparous (i.e., individuals spawn once and then die) anadromous fish with long freshwater rearing periods. Adults return to fresh water to spawn in fall and winter, but spawning usually occurs from February through March in gravelly riffles in small tributary streams (Moyle 2002). Juvenile river lamprey (ammocoetes) remain in silty backwater habitats, where they filter feed on various microorganisms for approximately 3–5 years before migrating to the ocean during late

spring periods (Moyle et al. 1995; Moyle 2002). Adult lamprey prey on other fish and may reach a total length of around 17 centimeters (cm) (Moyle et al. 1995).

As noted above, recent monitoring of materials dredged in the Delta at Rio Vista, downstream of the project area, have found low densities of lamprey (SWCA 2009). Sampling of river lamprey by midwater trawling upstream and downstream of the project area in Suisun Bay and at Sherwood Harbor (Sacramento River) reveals that most juvenile and small adult river lamprey are caught in December and larger adults principally are caught in January and early February (Hanni et al. 2006).

## **Starry Flounder**

The project area is part of designated essential fish habitat for starry flounder. Starry flounder are primarily marine or estuarine and are very common in the San Francisco Estuary but are relatively uncommon in the Delta (Moyle 2002). Spawning primarily occurs when surface water temperatures are around 11°C from December to January in nearshore marine habitats and possibly in San Francisco Bay (Orcutt 1950; Wang 1986). Females may produce 0.9–11 million eggs, with females reaching maturity at 40 cm total length and males at 35 cm (Moyle 2002). Larvae are pelagic and are carried inshore by currents, with young fish gradually moving from low-salinity habitat (2 ppt or less) during April–June to higher salinities of 10–15 ppt from July onwards (Baxter et al. 1999). Very few young-of-the-year were collected before June during sampling of the Bay-Delta (Baxter et al. 1999).

Starry flounder would be most likely to occur in the project area during low outflows as young-of-the-year fish, with abundance tending to be very low prior to June, when recruitment begins in earnest (Baxter et al. 1999). As the species grows, it tends to move into higher salinity waters and so would be unlikely to be present in the project area as yearling or older fish. USFWS seine sampling in the Bay-Delta from 1977–2007 (U.S. Fish and Wildlife Service 2009) found the species occurring as far upstream as river mile 24 on the Sacramento River and at around river mile 10 of Georgiana Slough; both stations are approximately two miles downstream of the project area.

## **Northern Anchovy**

The project area is part of designated essential fish habitat for northern anchovy. Northern anchovy is the most abundant fish in the San Francisco Estuary and provides forage for species such as salmonids, striped bass, and jacksmelt (Baxter et al. 1999). The central population, one of three found on the Pacific Coast, migrates into the San Francisco Estuary during the spring and summer and moves offshore and south in fall-winter (Baxter 1967 cited by Baxter et al. 1999: 167). Spawning occurs year-round but predominantly occurs at temperatures of 10–23°C with peaks in February–April and July–September (Wang 1986). Fish of about 90 mm total length and one year of age may be mature, whereas all fish greater than around 150 mm or 4 years of age are mature (Clark and Phillips 1952 cited by Baxter et al. 1999: 167). Females may spawn up to 130,000 eggs per year in multiple batches (Baxter 1967 cited by Baxter et al. 1999: 167). Within the San Francisco Estuary, the species is generally found at higher salinities, with means of over 27 ppt for young-of-the-year and older individuals (Baxter et al. 1999). No northern anchovy were collected in freshwater during extensive sampling in the San Francisco Estuary from 1980–1995 (Baxter et al. 1999).

A total of 45 northern anchovy were collected from 2002 to 2010 during the annual Spring Kodiak Trawl sampling program that is undertaken at 40 stations in the Bay-Delta from January to May (California Department of Fish and Game 2010). The species was collected in January–May, with collections in May being most common and accounting for 50% of samples containing northern

anchovy. The furthest upstream that the species has been collected from this sampling program is from station 508 in the vicinity of Chipps Island, some 30 miles downstream of the project area. Northern anchovy abundance is generally low in winter, increasing in spring, and high in summer, before declining again in the fall (Baxter et al. 1999). It is unlikely that northern anchovy would occur in the project area.

## Regulatory Setting

### Federal

Federal regulations that apply to biological resources present at the project site include the ESA and Section 404 of the Clean Water Act (CWA). These regulations are briefly described below.

#### Federal Endangered Species Act

The ESA prohibits the take of endangered or threatened fish or wildlife species. “Take” is defined to include harassing, harming (includes significantly modifying or degrading habitat), pursuing, hunting, shooting, wounding, killing, trapping, capturing, or collecting wildlife species or any attempt to engage in such conduct (16 USC 1532, 50 Code of Federal Regulations [CFR] 17.3). Actions that result in take can result in civil or criminal penalties.

The ESA prohibits the issuance of wetland permits for projects that would jeopardize the existence of a threatened or endangered wildlife or plant species. The U.S. Army Corps of Engineers (Corps) must consult with the USFWS when threatened or endangered species may be affected by a proposed project to determine whether issuance of a Section 404 Permit would jeopardize the species. In the context of the project site, the ESA would be triggered if the project would result in the take of a threatened or endangered species or if issuance of a Section 404 Permit or other federal agency action could adversely affect or jeopardize a threatened or endangered species.

#### Section 404 of the Clean Water Act

The Corps and EPA regulate the discharge of dredged and fill material into “waters of the United States” under Section 404 of the CWA. Corps jurisdiction over nontidal waters of the United States extends to the ordinary high-water mark provided the jurisdiction is not extended by the presence of wetlands (33 CFR Part 328 Section 328.4). The ordinary high-water mark is defined in the federal regulations to mean “[T]hat line on the shore established by the fluctuations of water and indicated by physical characteristics such as clear, natural line impressed on the bank, shelving, changes in the character of soil, destruction of terrestrial vegetation, the presence of litter and debris, or other appropriate means that consider the characteristics of the surrounding areas.” (33 CFR Part 328 Section 328.3[e]).

The Corps will typically exert jurisdiction over that portion of the project site that contains waters of the United States and adjacent or isolated wetlands. This jurisdiction includes the ordinary high-water mark and adjacent wetlands areas that will either be directly or indirectly adversely affected by the proposed project.

#### Migratory Bird Treaty Act

The Migratory Bird Treaty Act was established in 1918 to protect migratory birds. The MBTA protects species or families of birds that live, reproduce or migrate within or across international

borders at some point during their annual life cycle. The MBTA prohibits, unless permitted by regulations, the take of migratory birds. Take includes the harassment, hunt, capture, killing, possession, purchase or transport of migratory birds. This act also prohibits the take of any part, nest, or egg of any such bird. (16 USC 703.)

### **Magnuson-Stevens Fishery Conservation and Management Act**

The Magnuson-Stevens Fishery Conservation and Management Act (Magnuson-Stevens Act), as amended by the Sustainable Fisheries Act of 1996 (Public Law 104-267), established a requirement to describe and identify essential fish habitat (EFH) in each fishery management plan. EFH is defined as “waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity” (50 CFR 600.110). Important components of EFH are substrate; water quality; water quantity, depth, and velocity; channel gradient and stability; food; cover and habitat complexity; space; access and passage; and habitat connectivity. The act requires all federal agencies to consult with NMFS on all actions or proposed actions that are permitted, funded, or undertaken by the agency that may adversely affect EFH. Only species managed under a federal fishery management plan are covered under EFH regulations. All four Central Valley Chinook salmon runs (winter-, spring-, fall-, and late fall-run Chinook salmon) are subject to the Magnuson-Stevens Act and are regulated by the Pacific Coast Salmon Fishery Management Plan (FMP). The FMP includes designation of EFH, which occurs within waters potentially affected by the barrier. Within the project area, EFH is also designated for northern anchovy and starry flounder. Northern anchovy are regulated under the Coastal Pelagic Species FMP and starry flounder are regulated under the Pacific Coast Groundfish FMP.

### **Sustainable Fisheries Act**

The Sustainable Fisheries Act (Public Law 104-297) of 1996 reauthorized and amended the Magnuson Fishery Conservation and Management Act (now the Magnuson-Stevens Act), the latter of which was initially enacted in 1976 to define fisheries jurisdiction within federal waters and create the National Oceanic and Atmospheric Administration structure for federal fisheries management. The revisions provided in the 1996 law brought major changes to requirements for preventing overfishing and revitalizing depleted fisheries, mostly through the scientific management and reporting conducted via fisheries management reports.

## **State**

California regulations that apply to resources at the Proposed Project site include CESA and Section 1601 of the California Fish and Game Code. These regulations are briefly described below.

### **California Endangered Species Act**

CESA is similar to ESA but pertains only to state listed endangered and threatened species. CESA requires state agencies to consult with DFG when preparing documents under CEQA to ensure that the actions of the state lead agency do not jeopardize the continued existence of listed species. CESA directs agencies to consult with DFG on projects or actions that could affect listed species, directs DFG to determine whether there would be jeopardy to listed species, and allows DFG to identify “reasonable and prudent alternatives” to the project consistent with conserving the species. Agencies can approve a project that affects a listed species if the agency determines that there are “overriding considerations”; however, the agencies are prohibited from approving projects that would cause the extinction of a listed species.

Mitigating impacts on state-listed species involves avoidance, minimization, and compensation (listed in order of preference). Unavoidable impacts on state-listed species are typically addressed in a detailed mitigation plan prepared in accordance with DFG guidelines. DFG exercises authority over mitigation projects involving state-listed species, including those resulting from CEQA mitigation requirements.

CESA prohibits the “take” of plant and wildlife species state listed as endangered or threatened. DFG may authorize take if there is an approved habitat management plan or management agreement that avoids or compensates for impacts on listed species.

### **Fish and Game Code Section 1601: Streambed Alteration Agreements**

Under Chapter 6 of the California Fish and Game Code, DFG is responsible for the protection and conservation of the state’s fish and wildlife resources. Section 1601 et seq. of the code defines the responsibilities of DFG and requires that public and private applicants obtain an agreement to “divert, obstruct, or change the natural flow or bed, channel, or bank of any river, stream, or lake designated by the department [DFG] in which there is at any time an existing fish or wildlife resource or from which those resources derive benefit, or will use material from the streambeds designated by the department”. Public agencies file 1601 applications and private parties file 1603 applications for streambed alteration agreements.

The local DFG warden or unit biologist typically has responsibility for issuing streambed alteration agreements. These agreements usually include specific requirements related to construction techniques and remedial and compensatory measures to mitigate adverse impacts. DFG may also require long-term monitoring as part of an agreement to assess the effectiveness of the proposed mitigation.

In addition, DFG has adopted a no-net-loss policy for wetlands (Executive Order 11190; California Fish and Game Commission 1987).

### **California Department of Fish and Game Codes**

The DFG has regulations to prohibit take of birds, including migratory birds and raptors. DFG code 3503 states that it is unlawful to take, possess, or needlessly destroy the nest or eggs of any bird, except as otherwise provided by this code or any regulation made pursuant thereto. DFG code 3503.5 states that it is unlawful to take, possess, or destroy any birds in the orders Falconiformes or Strigiformes (birds-of-prey) or to take, possess, or destroy the nest or eggs of any such bird except as otherwise provided by this code.

## Impacts and Mitigation Measures

- a. Would the proposed project have a substantial adverse effect, either directly or through habitat modifications, on any species identified as a candidate, sensitive, or special-status species in local or regional plans, policies, or regulations, or by the California Department of Fish and Game or U.S. Fish and Wildlife Service?*
- d. Would the proposed project interfere substantially with the movement of any native resident or migratory fish or wildlife species or with established native resident or migratory wildlife corridors, or impede the use of native wildlife nursery sites?*

### Impact BIO-1 Disturbance of Active Swainson's Hawk Nests

The barrier project time table (February–May 2011) overlaps with the Swainson's hawk nesting season. Construction-related activities are not expected to affect nesting Swainson's hawks because construction will be completed in early March prior to the nesting season. Noise and visual disturbances associated with barrier construction and operation, maintenance, and removal activities within up to ¼ mile of occupied nest sites could adversely affect nesting Swainson's hawks. Noise and visual disturbances of sufficient magnitude could result in nest abandonment, a reduction in the level of care provided by adults (e.g., duration of brooding, frequency of feeding), or forced fledging if there are birds nesting within ¼ mile of the 2011 GSNPB Study area. However, because generator/barrier installation noise will occur prior to the nesting season, Swainson's hawks may choose nest sites outside the area of disturbance or may have become acclimated to the noise and therefore will not be affected. Nest-site disturbance may occur if Swainson's hawks are nesting in the area and are disturbed by removal of the barrier. As described in the Environmental Commitments section of Chapter 2, construction personnel will participate in a worker environmental awareness program, which would inform them about the potential presence of Swainson's hawks and nests, as well as their life history, and that unlawful take of the animal or destruction of its habitat is a violation of the ESA and/or CESA.

The potential disturbance of nesting Swainson's hawk from the project is considered significant because removal of the barrier could affect the nesting success of this special-status species. Implementation of the environmental commitment described above, and the following mitigation measures would reduce impacts on nesting Swainson's hawks to a less-than-significant level.

#### Mitigation Measure BIO-MM-1: Conduct Surveys to Locate Swainson's Hawk Nest Sites

Surveys for Swainson's hawk will be conducted at and adjacent to all locations to be disturbed by operations and maintenance activities and barrier removal to ensure that this species is not nesting in these locations. Preconstruction surveys will not be performed because construction will occur prior to the nesting period. Surveys will consist of surveying all potential nest sites within ¼ mile of the 2011 GSNPB Study area. The ¼-mile buffer is considered appropriate for this area as it is close to a settlement and several roads (California Department of Fish and Game 1994). Surveys will be performed several times during the 2011 GSNPB Study period of operation and maintenance to avoid and minimize impacts on nesting birds. Nest sites will be marked on an aerial photograph and the position will be recorded using GPS. Based on the results of the surveys, a risk assessment to Swainson's hawks nesting within ¼ mile of the 2011 GSNPB Study area will be provided to DFG.

### **Mitigation Measure BIO-MM-2: Minimize Project-Related Disturbances within ¼ Mile of Active Swainson's Hawk Nest Sites**

Barrier operations and maintenance activities and barrier removal will overlap with the Swainson's hawk breeding season. DWR will provide the locations of active nest sites identified during the surveys to DFG and will coordinate with DFG on appropriate avoidance and minimization measures on a case-by-case basis.

If 2011 GSNPB Study-related activities that may cause nest abandonment or forced fledging are necessary within the 0.25-mile buffer zone, DWR will monitor the nest site weekly. Monitoring will be performed by a qualified wildlife biologist. The biological monitor will have the ability to temporarily stop work if those activities appear to be causing imminent nest abandonment/failure. The biological monitor will notify DFG if the nest or nestlings are abandoned and the nestlings are still alive to determine the appropriate actions. DWR will fund the recovery and hacking (controlled release) of the nestlings. If a nest is abandoned and the nestlings do not survive, DWR will develop 0.5 acre of riparian forest and grant permanent conservation easements over that riparian forest and over 25 acres of suitable Swainson's hawk foraging habitat in a location and in a form acceptable to DFG. These easements shall be provided no later than 12 months after nest abandonment.

### **Impact BIO-2: Loss or Disturbance of Raptor Nests**

The project time table (February–May 2011) overlaps with the raptor nesting season which is typically February through August for most species but may begin as early as mid-January for great-horned owls. The riparian and oak woodland habitat in the project area provides nesting habitat for several species of raptors, including white-tailed kite and Cooper's hawk. Noise and visual disturbances of sufficient magnitude could result in the nest abandonment, a reduction in the level of care provided by adults (e.g., duration of brooding, frequency of feeding), or forced fledging. Noise disturbance, primarily from operation of the generator, could particularly disrupt nesting if nest sites are established before the generator operation period commences. If these situations occur, it could result in reducing the likelihood for successful production of young during the year of disturbance. Nest-site disturbance will occur only if raptors are nesting at the time the area around the nest is disturbed by construction or operation and maintenance activities.

The potential disturbance of nesting raptors from the project is considered significant because these actions could affect the nesting success of a special-status species. Implementation of the following mitigation measures would reduce impacts on nesting raptors to a less-than-significant level.

### **Mitigation Measure BIO-MM-3: Conduct Surveys to Locate Raptor Nest Sites**

Surveys for nesting raptors will be conducted at and adjacent to all locations to be disturbed by operations and maintenance activities and barrier removal to ensure that raptors are not nesting in these locations. Preconstruction surveys will not be performed because construction will occur prior to the nesting period. Surveys will consist of surveying all suitable nest sites within ¼ mile of the project area. The ¼-mile buffer is considered appropriate for this area as it is close to a settlement and several roads (California Department of Fish and Game 1994).

Surveys will be performed several times during the 2011 GSNPB Study period of operation and maintenance to avoid and minimize impacts on nesting birds. Nest sites will be marked on an aerial

photograph and the position will be recorded using GPS. Based on the results of the surveys, a risk assessment to raptors nesting within ¼ mile of the 2011 GSNPB Study area will be provided to DFG.

#### **Mitigation Measure BIO-MM-4: Minimize Project-Related Disturbances within ¼ Mile of Active Nest Sites**

Construction and operations and maintenance activities will overlap with the raptor breeding season. DWR will provide the locations of active nest sites identified during the surveys to DFG and will coordinate with DFG on appropriate avoidance and minimization measures on a case-by-case basis. If project-related activities that may cause nest abandonment or forced fledging are necessary within the 0.25-mile buffer zone, DWR will monitor the nest site. Monitoring will be performed by personnel under the direct supervision of a qualified wildlife biologist. The biological monitor will notify DFG if the nest or nestlings are abandoned and the nestlings are still alive to determine the appropriate actions. DWR will fund the recovery and hacking (controlled release) of the nestlings.

#### **Impact BIO-3: Loss or Disturbance of Migratory Bird Nests**

The project time table (February–May 2011) overlaps with the migratory bird nesting season which is March through August. Riparian, oak woodland, and ruderal habitats in the project area provide suitable nesting habitat for migratory birds protected under the MBTA. The pruning or clearing of vegetation and other activities associated with the project could result in the loss or disturbance of migratory bird nesting habitat. Activities which could affect nesting include equipment operation (e.g., crane) in the vicinity of active nests. Noise disturbance, primarily from operation of the generator, could particularly disrupt nesting if nest sites are established before the generator operation period commences. Implementation of the following mitigation measures would reduce impacts on nesting habitat.

#### **Mitigation Measure BIO-MM-5: Avoid and Minimize Effects on Nesting Birds**

DWR will perform preconstruction surveys to determine whether nesting birds are present within or immediately adjacent to the barrier construction access points, generator placement area, and associated staging and storage areas. DWR will remove all woody and herbaceous vegetation from the construction areas during the nonbreeding season (September 1–February 1) to minimize effects on nesting birds. During the breeding season all vegetation in the project work areas will be maintained to a height of approximately 6 inches to minimize the potential for nesting.

If active nests or migratory birds are found within the boundaries of the construction area, DWR will develop appropriate measures and will inform DFG of its actions. Inactive migratory bird nests (excluding raptors) located outside of the construction areas will be preserved. If an inactive migratory bird nest is located in these areas, it will be removed before the start of the breeding season (approximately February 1).

#### **Impact BIO-4: Loss or Disturbance of Western Pond Turtle Habitat**

Open water and adjacent uplands in the project area provide habitat for western pond turtle. Open water provides foraging habitat, escape cover, and a movement corridor. Upland habitat provide potential nesting habitat. Barrier construction and removal could result in the disturbance of open water habitat. Since sediment curtains or similar structures would not be installed, turtle movement would not be restricted. Construction and removal activities would be temporary because the

affected habitat would be restored following barrier removal therefore no mitigation measures are required for effects on open water habitat.

Barrier construction and removal activities could result in the disturbance of western pond turtle breeding habitat. Because the western pond turtle is designated as a state species of concern, this impact would be significant. Implementation of the following mitigation measures would reduce this impact to a less-than-significant level.

#### **Mitigation Measure BIO-MM-6: Install Exclusion Fencing for Western Pond Turtle**

The project time table (February–May 2011) overlaps with the western pond turtle nesting season which is typically March through August. To avoid the loss of western pond turtle nests and eggs as a result of construction, DWR will install exclusion fencing on the channel banks and on the landward perimeter of the existing riparian habitat to prevent turtles from nesting in the work areas. The exclusion fencing will extend down the channel bank and along the water line during non-work hours. The fencing could be removed daily for to accommodate access to construction personnel and reassembled for non-work periods. The exclusion fencing will consist of plastic orange mesh exclusion fence material or silt fence material. Fences will be installed up to a depth of 6 inches below the ground surface to prevent turtles from going under the fence. Fences will be installed before the nesting season (i.e., March 1) and remain in place until after the barrier and associated equipment and material are completely removed.

#### **Impact BIO-5: Loss or Disturbance of Special-Status Plants**

Suisun Marsh aster, Delta mudwort, and Mason's lilaeopsis were not observed in the project area (California Natural Diversity Database 2010). Additionally, no populations were identified in the project area during the 2010 survey. The shoreline in portions of the project area, particularly the downstream access point, is also subject to heavy pedestrian traffic with has resulted in pathways and other bare areas on the bank at this location, limiting the potential for establishment. Operations will not change hydrodynamics and associated tidal elevations and would not change the potential for plants to survive or establish in the project area. As such, there would be no impact.

#### **Impact BIO-6: Pile-driving Effects on Fish**

The installation and removal of the barrier have the potential to harass and displace fishes present in the general area of the construction activity. Construction is scheduled to occur in February, with removal by the end of May 2011. The shallow depth of the piles and substrate type mean that pile driving will proceed very rapidly. Pile driving would occur in February, with removal by crane, assisted (if necessary) by brief use of a vibratory hammer, in May.

Assuming that barrier construction would take 8 days in February and removal would take approximately 10 days in May, and that migration is spread reasonably constantly through each of these months, then, based on the general proportion of the juvenile population entering the Delta, the total proportion of downstream migrating salmonids potentially passing through the project area at these times is as follows (National Marine Fisheries Service 2009a: 633; Table 2):

- Fall-run Chinook salmon: 12%
- Spring-run Chinook salmon: 0.33%
- Winter-run Chinook salmon: 5.5%

- Steelhead: 9%

Based on passage above Red Bluff Diversion Dam, the proportion of the total adult Chinook salmon upstream migration that may pass through the project area in February and early May is approximately as follows (Vogel and Marine 1991; Table 3):

- Fall-run Chinook salmon: 0%
- Late-fall-run Chinook salmon: 5%
- Spring-run Chinook salmon: 1.5%
- Winter-run Chinook salmon: 7%

These estimates assume that most migrating salmonids use the mainstem Sacramento River. This is not necessarily true as recent studies have shown that perhaps 30–40% of outmigrating juvenile Chinook salmon may enter Steamboat and Sutter Sloughs, upstream of the project area, and reenter the Sacramento River approximately 9.3 miles downstream of the project area (Perry et al. 2010). The Steamboat/Sutter Sloughs migration route is also available to upstream migrating adult salmonids. As noted above, adult steelhead also migrate upstream during the construction period, and may also use the Steamboat/Sutter Sloughs migration route. As such, the actual percentage of fish in the Sacramento River during the construction and removal window is likely less than what is shown above. Note also that the actual period of time during which construction or removal is occurring is only a small proportion of the total work window (i.e., mid- to late February to late May). In addition, adult steelhead, green sturgeon, Sacramento splittail, and river lamprey could be migrating upstream at this time. Therefore, the actual potential for the harassment identified in the proceeding analysis is considered to be much less.

An interagency working group including NMFS has established interim criteria for evaluating underwater noise impacts from pile driving on fish. These criteria are defined in the document entitled “Agreement in Principle for Interim Criteria for Injury to Fish from Pile Driving Activities” dated June 12, 2008 (Fisheries Hydroacoustic Working Group 2008). This agreement identifies a peak sound pressure level of 206 decibels (dB) and an accumulated sound exposure level (SEL)<sup>1</sup> of 187 dB as thresholds for injury to fish. For fish less than 2 g, the accumulated SEL threshold is reduced to 183 dB. Although there has been no formal agreement on a “behavioral” threshold, NMFS uses 150 dB-RMS as the threshold for adverse behavioral effects (National Marine Fisheries Service 2009b).

Pile driving under the proposed project would be done with a vibratory driver. The interim criteria were established specifically for impact pile driving and were not intended to be applied to vibratory driving. However, for this assessment the interim criteria will be evaluated along with new criteria that have been recently proposed for vibratory driving (Hastings 2010). Pile driving noise modeling was conducted with the NMFS Underwater Noise Calculation Spreadsheet model (National Marine Fisheries Service 2009b). The Compendium of Pile Driving Sound Data (California Department of Transportation 2007) provides sound level data on a variety of pile sizes and driver types.

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<sup>1</sup> Sound exposure level (SEL) is defined as the constant sound level acting for one second, which has the same amount of acoustic energy as the original sound. Expressed another way, the sound exposure level is a measure of the sound energy in a single pile driver strike. Accumulated SEL (SEL<sub>accumulated</sub>) is the cumulative SEL resulting from successive pile strikes. SEL<sub>accumulated</sub> is based on the number of pile strikes and the SEL per strike; the assumption is made that all pile strikes are of the same SEL.

The 12-inch pile data are considered to be representative of the types of piles to be used and indicate the following source levels as measured at 10 meters from the pile:

- Peak<sup>2</sup> = 171 dB
- RMS = 155 dB
- Sound exposure level (SEL [for 1 second of vibratory driving]) = 155 dB.

In the absence of site-specific data, NMFS recommends using an underwater attenuation rate of 4.5 dB per doubling of distance (National Marine Fisheries Service 2009b). It also supports the notion that sound levels of less than 150 dB do not contribute to the accumulated SEL for the purposes of assessing injury (National Marine Fisheries Service 2009b). Using this assumption and attenuation rate, as well as 10 minutes of driving at each of up to 20 piles (12,000 seconds), the SEL<sub>accumulated</sub> is 196 dB at 33 feet and the calculated distance to each of the applicable thresholds is as follows:

- Distance to 206 dB-peak = less than 3.3 feet
- Distance to 150 dB-RMS = 72 feet
- Distance to 187 dB-SEL<sub>accumulated</sub> = 72 feet (for fish > 2 g)
- Distance to 183 dB-SEL<sub>accumulated</sub> = 72 feet (for fish < 2 g)

In other words, there is potential for behavior modification or injury to fish that remain within 72- foot radius during installation of all 20 piles that may be required to install the barrier. The same results are obtained if assuming as few as 10 piles being installed. Therefore, even if it is assumed that 50% of the piles are installed on one day and 50% on the following day, the 183-dB-SEL<sub>accumulated</sub> threshold distance remains the same over both days. As discussed above, the interim criteria adopted by the Fisheries Hydroacoustic Working Group (2008) are most relevant to impact pile driving, rather than the vibratory technique to be used to install the barrier at the entrance to Georgiana Slough. Recently proposed criteria suggest higher threshold levels that are specifically related to effects caused by vibratory hammers (Hastings 2010):

- Non-auditory tissue damage
  - Mass ≤ 0.6 g = 191 dB-SEL<sub>accumulated</sub>
  - For fish between 0.6 and 102 g mass, cumulative SEL = 195.28 + 19.28\*log<sub>10</sub>(mass)
  - Mass ≥ 102 g = 234 dB-SEL<sub>accumulated</sub>
- Auditory tissue damage
  - Hearing generalists (e.g., salmonids): > 234 dB-SEL<sub>accumulated</sub>
  - Hearing specialists (e.g., carp): 222 dB-SEL<sub>accumulated</sub>
- Temporary threshold shift (hearing loss)
  - Hearing generalists: 234 dB-SEL<sub>accumulated</sub>
  - Hearing specialists: 185 dB-SEL<sub>accumulated</sub>

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<sup>2</sup> Peak sound pressure refers to the highest absolute value of a measured waveform (i.e., sound pressure pulse as a function of time).

For the smallest fish ( $\leq 0.6$  g), the distance to the 191 dB-SEL<sub>accumulated</sub> threshold for non-auditory tissue damage would be slightly less than the 183 dB-SEL<sub>accumulated</sub> threshold (i.e., 68 feet). Assuming a weight of 1 g, the distance to the appropriate threshold for non-auditory tissue damage (i.e., 195.28 dB-SEL<sub>accumulated</sub>) would be 35 feet. By the alternative criteria, pile driving during barrier installation could temporarily affect some species in the project area. The level of effect would depend on the species' size and hearing specialization. In general, the species can be categorized as follows, based on presence or absence of a swimbladder and associated structures linking the swimbladder to hearing structures:

- Chinook salmon, steelhead, delta smelt, and longfin smelt: hearing generalists
- Sacramento splittail: hearing specialists
- Green sturgeon, Pacific lamprey, and river lamprey: low hearing sensitivity

Salmonids (Chinook salmon and steelhead) would be large enough and have high enough accumulated sound exposure thresholds that they would be unlikely to be significantly affected by pile driving, particularly as they would probably move away from the area upon sensing the pile driving. Small fish occurring in the area at this time could include larvae of longfin smelt and delta smelt, although occurrence of a major proportion of the population so far upstream would be unlikely except in a very low-flow year (Dege and Brown 2004). Adult delta smelt and longfin smelt in the project area generally would be large enough<sup>3</sup> not to suffer non-auditory tissue damage, particularly because they would probably be unlikely to be exposed for full duration of the pile driving. A small fraction of the larval population could be exposed, but the construction window is early in the delta smelt spawning season. Assessments of reproductive stage during the Spring Kodiak trawling from 2002-2010 indicate that the average percentage of mature or spent adult delta smelt is less than 1% in January, around 5.3% in February, and increasing to just over 18% in March. This suggests that any construction impacts primarily would occur to adult delta smelt and there would be little effect on larvae or early juveniles. A fraction of the larval population of longfin smelt could be exposed to pile driving, as the construction window is within the spawning season and at the time when larvae are most abundant in the Bay-Delta (Baxter et al. 1999). However, as noted above, recent monitoring suggests that only a very small proportion of the overall population would be in the vicinity of the project during construction.

Hearing specialists such as Sacramento splittail would be susceptible to temporary hearing loss if they remained within the vicinity of the pile driving for most of its duration. However, these species would be unlikely to remain within the vicinity of pile driving for the full duration. Pile driving would not result in auditory tissue damage for these species and because of the relatively short duration would not significantly affect the species.

Species with low sensitivity to sound such as green sturgeon, Pacific lamprey, and river lamprey would not suffer hearing loss or auditory tissue damage, and they would be large enough to avoid non-auditory tissue damage.

The potential effects of pile driving would be minimal because:

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<sup>3</sup> For example, adult delta smelt of around 60 mm would be expected to weigh just under 2 g (Kimmerer et al. 2005); applying the equation above, the SEL<sub>accumulated</sub> would be around 200 dB. Longfin smelt of around 60 mm (9–10 months old; Moyle 2002) in February would be expected to weigh around 1.8 g (Kimmerer et al. 2005); applying the equation above, the SEL<sub>accumulated</sub> would be around 200 dB.

- the effects would be temporary (up to 2 days of pile driving, consisting of driving up to 20 piles for about 10 minutes per pile) and would affect a very small proportion of the migrating populations;
- a vibratory method of pile installation would be used which minimizes disturbances to fish over other impact-type pile driving methods;
- for most activities, the effects of pile driving on fish would likely be limited to avoidance behavior in response to movements, noises, and shadows caused by construction personnel and equipment operating in or adjacent to the water body. Additionally, the duration of pile driving would be minimal and would require approximately 10 minutes per pile to complete <sup>4</sup>;
- only a very small channel area would be disturbed or affected by construction; and
- most fish are expected to move away from the area of disturbance.

As described in the Environmental Commitments section of Chapter 2, construction personnel will participate in a worker environmental awareness program, which would inform them about the potential presence of listed fish species, as well as their life histories, and that unlawful take or destruction of their habitat is a violation of the ESA and/or CESA. The noise generated by pile driving is a less-than-significant effect and no mitigation is required.

### **Impact BIO-7: Decreased Water Quality and Increased Aquatic Habitat Disturbance During Construction**

Installation and removal of the barrier in February and May, respectively, has the potential to decrease water quality through substrate disturbance and to disturb fish in the immediate project area. Fish could be affected by increased turbidity, increased suspended sediments, and increased water column concentration of contaminants that would otherwise be located in the substrate. Fish response to increased turbidity and suspended sediment ranges from behavioral changes (alarm reactions, abandonment of cover, and avoidance) to sublethal effects (e.g., reduced feeding rate), and, at high suspended sediment concentrations for prolonged periods, lethal effects (Newcombe and Jensen 1996). Sediment toxicity has been demonstrated in the Delta, although the effects on fish are less clear (Johnson et al. 2010).

Few delta smelt and longfin smelt would be expected to be in the project area during construction, as described above in Impact BIO-6. Delta smelt and longfin smelt juveniles and adults that do enter the project area during the specified construction periods are likely to experience increased turbidity and sediment-associated toxicant levels, noise, and potential harassment by construction activities. However, increased turbidity often correlates with higher abundance of delta smelt (Feyrer et al. 2007; Nobriga et al. 2008), although the reason for this is unknown; potential explanations include concealment from predators and improved contrast of prey against a turbid background enhancing feeding (Feyrer et al. 2007). The main populations of delta smelt and longfin smelt would be well downstream of the construction effects and, through dilution, would be very unlikely to experience any adverse effects of construction activities.

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<sup>4</sup> For example, if 20 piles had to be driven and each took 10 minutes to drive, this would total around 0.5% (200 of 40,320 minutes) of the overall time in the month. Assuming for winter-run Chinook salmon that 19% of juveniles and 14% of adults pass the project area in February (Tables 2 and 3), this would equate to exposure of around 0.1% and 0.07% of the juvenile and adult migrating populations to the pile driving; an even smaller proportion of the populations would be exposed if some individuals migrated via Steamboat or Sutter Sloughs.

Other special-status fish species may be more likely to be in the project area, i.e., Chinook salmon, steelhead, green sturgeon, Sacramento splittail, and river lamprey. The proportion of Chinook salmon and steelhead populations migrating during February was discussed above in relation to pile driving. The presence of some species could be determined by the timing of migrations in relation to hydrological conditions, e.g., Pacific lamprey juveniles may be more likely to be in the project area following higher flow events.

As with other species, substrate disturbance temporarily could affect water quality in EFH for northern anchovy and starry flounder. However, both species are unlikely to occur in the project area in considerable abundance. For example, there are no records of northern anchovy salvage at the CVP or SWP fish salvage facilities nor in the vicinity of the project as determined from Spring Kodiak trawling (see life history summary above), indicating that presence of the species in the Delta is highly unlikely during the project period. Occurrence of young-of-the-year starry flounder is possible but generally occurs further downstream. Any temporary increases in turbidity, suspended sediment, and water column contaminants due to barrier installation would be greatly diluted before reaching the main areas of EFH that northern anchovy and starry flounder.

The temporary nature of the disturbance (up to 8 days for installation and 10 days for removal); implementation of an erosion control plan and turbidity monitoring, as described in the Environmental Commitments section of Chapter 2; and the small scale of any associated changes in water quality would ensure that the impact is less than significant and requires no mitigation.

### **Impact BIO-8: Barrier Operations Effects on Fish**

Operations would begin after March 1, in early to mid-March, and run for less than 60 days. The total proportion of downstream migrating salmonids potentially passing through the project area at this time is as follows (National Marine Fisheries Service 2009a: 633):

- Fall-run Chinook salmon: 29%
- Spring-run Chinook salmon: 96%
- Winter-run Chinook salmon: 38%
- Steelhead: 60%

This assumes that all fish use the Sacramento River pathway and not the Sutter/Steamboat Slough pathway. The barrier avoids hydrodynamic changes at the natural flow split between Georgiana Slough and the Sacramento River. There would be virtually no changes in hydrodynamics and therefore no impacts on fish related to water quality or food availability and distribution.

The barrier would potentially reduce the likelihood that juvenile outmigrating salmon, particularly spring-run Chinook salmon, winter-run Chinook salmon, fall-run Chinook salmon, and Central Valley steelhead, would follow the natural split into Georgiana Slough leading to the interior Delta. The probability of successful migration to Chipps Island is lower via the interior Delta than for fish remaining in the mainstem Sacramento River (Perry et al. 2010). The barrier is intended to serve as a beneficial barrier to juvenile salmon migrating downstream in the Sacramento River and it has the potential to increase smolt survival because it guides fish down the Sacramento River and away from Georgiana Slough (and into the interior Delta where they have an increased risk of predation and entrainment). Juvenile salmonids such as Chinook salmon tend to occupy the upper 13 feet of the water column (Kimmerer 2008) and so some may pass beneath the barrier, which will be at a depth of approximately 8-12 feet. Based on the results of the 2009–2010 testing at the HOR (Bowen

et al. 2009: 2010), deterrence could be over 80% but this may not translate into increased survival if predators are attracted to the barrier support structure in the water. Bowen et al. (2010) observed that striped bass swam along immediately adjacent to the HOR barrier infrastructure. There is a large scour hole at the downstream end of the Georgiana Slough barrier that is analogous to the scour hole at HOR, which was believed to harbor predators such as striped bass that fed upon some of the deterred fish (Bowen et al. 2009). Predation will likely depend on the hydrodynamic conditions experienced during the study, e.g., lower predation may occur with higher flows (Bowen and Bark 2010). Survival of the fish bearing acoustic tags will allow the role of predation to be examined further, as will tracking of tagged predators and DIDSON monitoring of the barrier vicinity for predators in the 3 hours before and after turning the barrier on or off (and at other times that benefit the study). Any juvenile salmonids swimming through the barrier likely would experience only momentary discomfort and no long-lasting effects.

Delta smelt and longfin smelt could be present within the project area during operation of the barrier as both adults and juveniles, although few or none have been collected near the project site in recent years. Low outflow tends to lead to greater upstream distribution by delta smelt and longfin smelt (Dege and Brown 2004). There remains the potential for deterrence of delta smelt and longfin smelt from migratory pathways on the Sacramento River and Georgiana Slough. Laboratory studies have shown that significant deterrence of delta smelt by a barrier may occur if through-barrier water velocity is sufficiently low to allow avoidance (Mark Bowen, U.S. Department of the Interior, Bureau of Reclamation, unpublished data). Assuming that longfin smelt are physiologically similar to delta smelt with respect to hearing, i.e., hearing generalists, they may also be deterred by the barrier. Delta smelt are assumed to occupy the top 13 feet of the water column (Kimmerer 2008) and so some individuals may pass beneath the barrier, which will occupy the top 8-12 feet of the water column depending on tidal state. The majority of longfin smelt one- and two-year-olds occupy deeper portions of the water column, although this may be temperature-dependent (Rosenfield and Baxter 2007) and has not been well studied in relatively shallow waters such as found in the project area. Regardless, many individuals may pass beneath the barrier and avoid deterrence. Any delta smelt and longfin smelt passing through the barrier likely would experience only momentary discomfort and no long-lasting effects. Although unlikely, it is possible that some delta smelt and longfin smelt spawning and egg development could occur in the vicinity of the project during barrier operation. Eggs would be unlikely to suffer any negative effects from the barrier's sound signal because the sound is highly focused within the bubble curtain and typically disperses within a few meters (Bowen and Bark 2010). In any case, in situ testing with Pacific herring eggs as a proxy for delta smelt eggs during the previous acoustic barrier testing in 1994 found no evidence of reduced hatching success or embryonic mortalities following exposure of 24–312 hours to sound signals (Hanson et al. undated). There is potential for increased predation in the project area should increased concentrations of predatory fish occur in the vicinity of the barrier infrastructure and/or in the scour hole downstream of the barrier alignment.

The potential effects discussed above for delta smelt and longfin smelt generally would be applicable to Sacramento splittail. However, the likelihood of Sacramento splittail occurring in the project area during barrier operation is greater than for either species of smelt, although the peak of young-of-the-year abundance is typically in May or June and so adults are more likely to be present during barrier operations (see below).

Juvenile sturgeon and lamprey would be unlikely to be affected by operations of the barrier because of their low hearing sensitivity. In addition, the epibenthic nature of sturgeon would allow them to swim beneath the barrier.

Passage of northern anchovy or starry flounder migrating in the Georgiana Slough-Sacramento River divergence area could be affected should they approach the barrier. Starry flounder are unlikely to be affected because a) they are benthic and so would likely pass beneath the barrier through the 10 to 15 feet clearance above the bottom, and b) their lack of a swimbladder and specialized hearing structures makes them generally insensitive to acoustic deterrence, particularly at the settings used for deterrence of Chinook salmon smolts (Nedwell et al. 2004). Northern anchovy would be more likely than starry flounder to be affected by the operation of the barrier upon encounter because of pelagic water column distribution and sensitivity to acoustic sounds. However, as noted above, the northern anchovy is unlikely to occur in the project area and so is unlikely to be affected. As with starry flounder, any temporary increase in turbidity or contaminant concentration associated with site preparation and barrier construction would be diluted before reaching northern anchovy's core EFH downstream of the Delta. Therefore, this species' EFH also is not expected to be adversely affected by the temporary alteration of habitat associated with the barrier.

The localized nature of the barrier's effect and the potential benefit to salmonids that may otherwise enter the interior Delta down Georgiana Slough indicate that this is a less-than-significant impact.

### **Impact BIO-9: Delayed Upstream Migration of Adult Anadromous Fish**

Assuming that the barrier would be operated in March and April, the proportion of the total adult Chinook salmon upstream migration that may pass through the project area during this time is approximately as follows (Vogel and Marine 1991; Table BIO-5):

- Fall-run Chinook salmon: 0%
- Late-fall-run Chinook salmon: 7.5%
- Spring-run Chinook salmon: 2.5%
- Winter-run Chinook salmon: 62.5%

March is the last month of peak adult steelhead migration suggested by McEwan (2001), with lesser migration expected in April.

Upstream migrating adult Chinook salmon and steelhead could be affected by barrier operation because they are sensitive to stimuli emitted by the barrier. Although most adults would probably be migrating up the Sacramento River and so could avoid the barrier after first contact, some may be migrating up Georgiana Slough when the barrier is turned on and therefore would have to swim through or under the bubble curtain or return down Georgiana Slough and find a different pathway to the Sacramento River. The vertical distribution of upstream migrating adult Chinook salmon and steelhead in the Central Valley is not well known, but data for other locations suggest depths less than the depth of the barrier are the most often used (Gray and Haynes 1977; Quinn 2005). However, observations by local biologists and models of depths at which migration energy costs are reduced (Hughes 2004) suggest use of waters very close to the bottom and therefore below the barrier. Depth distribution of adults is likely to vary depending on water characteristics such as temperature and velocity (Quinn 2005).

It is unlikely that the barrier would delay upstream migrating salmonids to a great extent. This is inferred from tracking studies of adult fall-run Chinook salmon conducted as part of the earlier Georgiana Slough acoustic deterrent studies (Hanson et al. undated). There was no significant delay in upstream passage time and only a 9% decrease in passage time when considering both upstream and downstream passage (Hanson et al. undated). Such a delay would not be considered significant

in the context of reaching spawning grounds in good condition (Hanson et al. undated). The acoustic barrier used in those studies had a much wider potential area of effect on non-target species or life stages than the current barrier because there was no bubble curtain to constrain the sound; elevated sound pressure levels could be detected up to 0.25 miles away (Hanson et al. undated). It is therefore assumed that the minimal effect observed on adult salmonids from the earlier studies is generally applicable to the present barrier. As described in the Environmental Commitments section of Chapter 2, monitoring with the DIDSON during barrier operation will be used to check that no obvious delay to adult salmonids is occurring. Adult salmonids also could avoid the barrier by swimming beneath it. Any adult salmonids swimming through the barrier likely would experience only momentary discomfort and no long-lasting effects.

Adult green sturgeon may be present during the period when the barrier is operating. The barrier at Georgiana Slough has been designed with 10 to 15 feet of clearance above the substrate at the deepest section of the river and therefore can easily accommodate passage of green sturgeon, an epibenthic species (Moyle 2002). Deterrence of green sturgeon is unlikely because sturgeons do not possess specialized hearing structures and lack swimbladders, rendering them generally insensitive to the pressure-dominated sound fields used to deter salmon (Lovell et al. 2005). Green sturgeon therefore are not expected to be impacted by the operation of the barrier.

Sacramento splittail could be migrating upstream through the project area during barrier operation in order to spawn (Moyle 2002). Young-of-the-year and yearling splittail are found in shallower water (less than 6.5 feet deep; Sommer et al. 1997), whereas adults typically move into deeper water. They are cyprinids (minnows) and therefore hearing specialists that would be strongly deterred if encountering the barrier. It is generally expected that splittail would avoid the barrier either by moving around it or under it when operational.

Upstream migration of river lamprey largely occurs in the fall and winter and so probably only a small portion of the run would be in the project area during barrier operation. Upstream migration of Pacific lamprey generally occurs in the spring and summer, so there is a greater likelihood of this species occurring in the project area during barrier operation. Given the low sensitivity of lampreys to acoustic stimuli, the barrier is unlikely to delay upstream migration, in addition to the possibility that the species uses deeper water for migration in order to conserve energy.

This impact is less than significant and no mitigation is required.

***b. Would the proposed project have a substantial adverse effect on any riparian habitat or other sensitive natural community identified in local or regional plans, policies, or regulations, or by the California Department of Fish and Game or U.S. Fish and Wildlife Service?***

### **Impact BIO-10: Loss or Disturbance of Instream Cover and Riparian Habitat**

Barrier construction will include land- and water-based construction methods. Some sections of the barrier will be constructed in the staging area on the south side of Georgiana Slough and will be transported to the water's edge where the sections will be loaded onto a barge. Additionally, cables lying on the ground will connect the barrier to the staging area equipment during operation. DWR will attempt to avoid impacts to riparian vegetation, however because of the limited access to the water's edge at this location some pruning or clearing of riparian vegetation may be required. Barrier construction at the upstream end of the project area will be entirely water-based therefore there will be no riparian impacts at this location. As described in the Environmental Commitments

section of Chapter 2, if riparian areas are affected, they will be restored to pre-project conditions. If any instream cover habitat such as woody material is found to impede the location of equipment associated with the barrier, the instream cover will be relocated to the minimum extent necessary to allow barrier equipment installation and operation. Because the potential impacts to instream cover and riparian habitat are minimal and the area would be restored to pre-project conditions upon completion of construction, this impact is less than significant and no mitigation is required.

- c. Would the proposed project have a substantial adverse effect on federally protected wetlands as defined by Section 404 of the Clean Water Act (including, but not limited to, marshes, vernal pools, coastal wetlands, etc.) through direct removal, filling, hydrological interruption, or other means?***

### **Impact BIO-11: Loss or Disturbance of Other Waters of the United States**

The barrier construction will include water-and land-based construction methods. The barrier will be approximately 700 feet long and will be installed in the river bed. The barrier will result in the temporary fill of less than approximately 0.01 acres of open water. The temporary fill will result from the placement of the piles that will be driven into the river bed. The barrier will be in place for less than 60 days, after which time all components will be completely removed. The temporary loss of benthic habitat because of the barrier piles and concrete piers, and hydrophone cables and anchors, would result in a temporary reduction in a) critical habitat for green sturgeon, winter-run and spring-run Chinook salmon, and steelhead, b) essential fish habitat for starry flounder, c) foraging habitat for Sacramento splittail, and d) benthic habitat for river lamprey and Pacific lamprey. There is also potential for the insertion of piles into the substrate to affect species buried there. Recent monitoring of materials dredged in the Delta at Rio Vista, downstream of the project area has found low densities of lamprey (SWCA 2009). The small scale of the loss (less than 0.01 acre) and the short duration indicate that the temporary placement of the barrier will not have a significant impact on open water habitat and therefore no mitigation is required.

- e. Would the proposed project conflict with any local policies or ordinances protecting biological resources, such as a tree preservation policy or ordinance?***

- f. Would the proposed project conflict with the provisions of an adopted habitat conservation plan, natural community conservation plan, or other approved local, regional, or state habitat conservation plan?***

The proposed project would neither conflict with any local policies/ordinances protecting biological resources nor conflict with the provisions of any adopted habitat conservation plan, natural community conservation plan, or other approved local, regional, or state habitat conservation plan. The proposed project supports compliance with Action IV.1.3 of the NMFS (2009a) OCAP BO RPA that requires that the U.S. Department of the Interior, Bureau of Reclamation (Reclamation) and/or DWR to consider engineering solutions to further reduce the diversion of juvenile salmonids into the interior Delta, and reduce exposure of the fish to SWP and CVP export facilities. As such, the proposed project is complying with an ESA requirement mandated by NMFS.

## V. Cultural Resources

| V. Cultural Resources |   | Potentially<br>Significant<br>Impact | Less-than-<br>Significant with<br>Mitigation<br>Incorporated | Less-than-<br>Significant<br>Impact | No<br>Impact             |
|-----------------------|---|--------------------------------------|--|-------------------------------------|--------------------------|
| Would the project:    |   |                                      |  |                                     |                          |
| a.                    | Cause a substantial adverse change in the significance of a historical resource as defined in Section 15064.5?          | <input type="checkbox"/>             | <input checked="" type="checkbox"/>                          | <input type="checkbox"/>            | <input type="checkbox"/> |
| b.                    | Cause a substantial adverse change in the significance of a unique archaeological resource pursuant to Section 15064.5? | <input type="checkbox"/>             | <input checked="" type="checkbox"/>                          | <input type="checkbox"/>            | <input type="checkbox"/> |
| c.                    | Disturb any human remains, including those interred outside of formal cemeteries?                                       | <input type="checkbox"/>             | <input checked="" type="checkbox"/>                          | <input type="checkbox"/>            | <input type="checkbox"/> |

## Introduction and Methods

This section describes the existing environmental setting of the proposed project and the impacts on cultural resources that implementation of the proposed project might cause. *Cultural resource* is a general term that encompasses the National Historic Preservation Act's (NHPA's) historic property as well as CEQA's historical resource and unique archaeological resource (see Regulatory Setting below for definitions of *historical resource* and *unique archaeological resource*). *Cultural resources* are defined as buildings, sites, structures, or objects, each of which may have historical, architectural, archaeological, cultural, or scientific importance. According to guidance published by the Office of Historic Preservation (1995:2), any "physical evidence of human activities over 45 years old may be recorded for purposes of inclusion in the [Office of Historic Preservation's] filing system." In other words, physical evidence of human activities more than 45 years old is considered a cultural resource.

Methods to assess the proposed project's impacts on cultural resources consisted of a records search and literature review, as well as a search of the California State Lands Commission's shipwreck database. Methods are described in detail below.

## Records Search and Literature Review

A records search was conducted at the North Central Information Center (NCIC) of the California Historical Resources Information System (CHRIS) on October 8, 2010 (Records Search No. SAC-10-138). The CHRIS is the State of California's official repository of previous cultural resource studies and known cultural resources; the NCIC administers the CHRIS records for a six-county area that includes Sacramento County. A literature review was conducted at ICF International's cultural resources library in Sacramento.

During the records search, the following sources of information were consulted.

- NCIC base maps of previous cultural resource studies and recorded cultural resources
- Historic maps (General Land Office 1859; United States Geological Survey 1937)

- The Survey of Surveys (Office of Historic Preservation 1989)
- The Historic Property Data File (Office of Historic Preservation 2010a:74–77)
- Archeological Determinations of Eligibility (Office of Historic Preservation 2010b:167–169)
- National Register of Historic Places (NRHP) (National Park Service 2010)
- California Register of Historical Resources listings
- California Inventory of Historic Resources (California Department of Parks and Recreation 1976 and updates)
- California Points of Historical Interest (California Department of Parks and Recreation 1992 and updates)
- California Historical Landmarks (California Department of Parks and Recreation 1996 and updates)

The records search indicates that five cultural resource studies have been conducted on the landside portion of the project area (Dougherty 1991:Map 1; Foster 1992:Figure 1; Johnson 1974; Kielusiak 1982; Soule 1976). In addition, 10 cultural resource studies have been conducted within a 0.25-mile (mi) radius of the project area (Brown 1993:Figure 2; Deitz 1999:Map 4; Graichen 1994; Hermann and Sikes 2005:Figure 1; Hope 2004; Johnson 1974; Jones & Stokes Associates 1998:Figure 1; Leach-Palm et al. 2008; Lydecker 2010:Figure 4-56; Martinez and Arrington 2008:Figure 1). No submerged cultural resource investigations have been conducted in the waterside portion of the project area.

The records search indicates that one previously recorded cultural resource is located in the project area: P-34-356/CA-SAC-329 (Dougherty 1991; Foster 1992; Johnson 1974; Kielusiak 1982; Soule 1976). In addition, eight previously recorded cultural resources are located within a 0.25-mi radius of the project area: P-34-2134, the Walnut Grove Branch Line of the Southern Pacific Railroad, WG-ISO-1 (a railroad-related feature), the Walnut Grove Primary School, Walnut Grove Commercial and Residential District, the Imperial Theatre, and bridges 24C0005 and 24C0039.

## Shipwrecks Database

ICF consulted the California State Lands Commission's Shipwrecks Database (2010) to determine whether historic shipwrecks may be present in the project area. The database was searched by selecting Sacramento County in the search field, which generated a list of 12 shipwrecks in Sacramento County. The database search yielded latitude and longitude coordinates for each of the shipwrecks. The coordinates were plotted using an online mapping program (<http://www.itouchmap.com/latlong.html>) to determine whether any of the shipwrecks were in the project area. The database did not report any shipwrecks in the project area.

Additionally, a recent bathymetry study at the proposed location for the barrier indicated that there are no shipwrecks in the area (California Department of Water Resources 2010).

## Pedestrian Survey

On October 13, 2010, an ICF archaeologist conducted a walking survey of the proposed construction staging area. The survey was conducted by walking transects spaced 15 feet apart across the staging area. Most of the staging area, situated at the toe of Andrus Island's exterior levee, consists of a gravel-and-dirt road surface. Ground surface visibility was 85% in the roads. East and north of the

road, the staging area contains dense riparian vegetation, impenetrable but for a few footpaths to the water's edge. Ground surface visibility along paths was generally 100%, whereas the riparian vegetation offered no visibility. The riverbank itself was covered with riprap, also confounding examination of the ground surface. Cut banks—exposures of native and fill sediments—were available along the river road and portions of the Sacramento River bank. No archaeological materials or other cultural resources were identified in the project area.

## Physical Setting

### Prehistoric Setting

Although the Sacramento Valley may have been inhabited by humans as early as 10,000 years ago, the evidence for early human occupation is likely buried by deep alluvial sediments that accumulated rapidly during the late Holocene Epoch (Johnson 1967:283–284; Rosenthal et al. 2007:151).

Preliminary results from Tremaine & Associates' recent excavations at Sacramento City Hall (Sacramento City Hall overlies the Nisenan village of Sacum' ne, CA-SAC-38) reveal the earliest confirmed habitation of the immediate Sacramento vicinity (3000–8000 B.P.) (Tremaine 2008:99–101).

Later periods of prehistory are better understood because of their more abundant representation in the archaeological record. Fredrickson (1973) identified three general patterns of cultural manifestations for the period between 4500 and 100 B.P.: the Windmill, Berkeley, and Augustine Patterns.

The Windmill Pattern (4500–2800 B.P.) shows evidence of a mixed economy consisting of the generalized hunting of game, fishing, and use of wild plant foods. Settlement strategies during the Windmill period reflect seasonal occupation of valleys during the winter and of the foothills during the summer (Moratto 1984:201, 206).

Cultural changes are manifested in the Berkeley Pattern (3500–2500 B.P.). Technological changes in groundstone from handstones and milling slabs to the mortar and pestle indicate a greater dependence on acorns, and the presence of a wide variety of projectile points and atlatls indicates hunting was still an important activity (Fredrickson 1973).

The Berkeley Pattern was superseded by the Augustine Pattern around 1450 B.P. and reflects a change in subsistence and land use patterns similar to those of the ethnographically known people of the proto-historic era. This pattern exhibits a great elaboration of ceremonial and social organization, including the development of social stratification. Elaborate exchange systems, further reliance on acorns, and a wide variety of artifacts (flanged tubular smoking pipes, harpoons, clamshell disc beads, and an especially elaborate baked clay industry) are associated with the Augustine Pattern. Increased village sedentism, population growth, and an incipient monetary economy are also hallmarks of this pattern. (Moratto 1984:211, 213.)

### Ethnographic Setting

The Plains Miwok are part of the larger Eastern Miwok group that forms one of the two major divisions of the Miwokan subgroup of the Utian speakers. The Plains Miwok lived in the Central Valley along the Sacramento, Cosumnes, and Mokelumne Rivers. Like their neighbors to their north,

the Plains Miwok, out of necessity, built their homes on high ground, with major villages concentrated along the major waterways. Conical homes were constructed with poles and thatching of brush, grass, or tule, and semisubterranean earth-covered homes were built as well. Major villages contained an assembly house, which was a semisubterranean structure with a diameter of 40 to 50 feet (ft), as well as a sweathouse, which was a scaled-down version of the assembly house. (Levy 1978:408–409, Figure 1.)

The Plains Miwok gathered food resources as the seasons varied. As with most California tribes, the Plains Miwok relied heavily on the acorn for subsistence. Other foods that were gathered include nuts, seeds, roots, greens, berries, and mushrooms. Animal foods included tule elk, pronghorn antelope, jackrabbits, squirrels, beaver, quail, and waterfowl. Salmon was the dominant animal food resource, ranking above other river resources, such as sturgeon. Salt, nuts, basketry, and obsidian were obtained through trade with the Sierra Miwok to the east, for shells, basketry, and bows obtained in turn through trade from the west. (Levy 1978:402–405, 411–412.)

Technological items of the Plains Miwok are similar to those of the Valley Nisenan (see below). Wooden digging sticks, poles, and baskets were used for gathering vegetal resources, while stone mortars, pestles, and cooking stones were used for processing. Items used for obtaining animal resources included nets, snares, seines, bows, and arrows. Arrow points were made primarily of basalt and obsidian. (Levy 1978:405–406.)

The Plains Miwok, like most California Indian tribes, organized their political and community affairs along what anthropologists call “tribelet” lines. A tribelet consists of a group of villages, is typically named for the principal village, and represents the most sociopolitically cohesive unit among California Indians (Bean 1978:673.) The specific Plains Miwok tribelet that inhabited the project area is known as the Unisumne or Junizumne (Levy 1978:Figure 1; Milliken 1995:258, Map 5). The principal Unisumne village is thought to have been at the site of present-day Walnut Grove (Soule 1976:10). Spanish mission records indicate that individuals from the Unisumne were baptized at Mission San José between 1813 and 1836 (Milliken 1995:258). The combined effects of Spanish military raids, infection from European diseases, and dispersal and displacement at the hands of a burgeoning Euroamerican population resulted in many Plains Miwok deaths and removal from their homelands. In the early twentieth century, the federal government purchased small parcels of land (2–300 acres) for Miwok reservations. (Levy 1978:400–401.) As a consequence of these phenomena, most present-day Plains Miwoks are associated with Sierra Miwok tribes in the foothills (an exception being the Wilton Miwok Rancheria).

## Historic Setting

Following the establishment of Mission San José in 1797, the Spanish mounted exploratory forays into the Delta and lower Sacramento Valley. The first well-documented European exploration of the general region occurred in 1808, when Spanish explorer Gabriel Moraga led an expedition from Mission San José to the northern Sacramento Valley (Hoover et al. 2002:301). The earliest Euroamerican settlement in the region coincided with the establishment of land grants by the Mexican government in the 1840s. John A. Sutter obtained the first such grant in 1841 at his New Helvetia Rancho, which encompassed lands on the east banks of the Feather and Sacramento Rivers (Hoover et al. 2002:302). The gold rush of 1848–1849 ensued shortly thereafter.

Agriculture and ranching were the primary industries in the present-day Sacramento County during the early historic period. Regional ranching originated on the New Helvetia Rancho in the early

1840s. The gold rush precipitated growth in agriculture and ranching because ranchers and farmers realized handsome returns from supplying food and other goods to miners. Frequent floods plagued the residents of the region, however, and posed a significant threat to the viability of agricultural interests and further settlement.

## **Andrus Island**

The discovery of gold in 1848 brought an influx of settlers into California, changing the Delta region as transportation needs and the demand for farmland increased. George Andrus settled at the northern end of Andrus Island to farm in 1852. Because of the island's smaller and less densely wooded natural levees compared to more northern Delta areas, little additional farming was taken up until 1855. By 1861, 13 farms were operating on the island, fronting on the Sacramento River. (Schulz and Farris 1994:104.)

The increasing number of farms by 1861 prompted the formation of Swampland District 8 for the purposes of flood protection and land reclamation. In the first year of the district's operation, only 1.5 mi of low levees had been constructed, all built by Andrus in the vicinity of his landholdings. Following the flood of January 1862, in which the entire island was flooded, landowners on Andrus Island began building levees around their own land. Swampland District 8 was divided into five separate districts about this time. Andrus Island possessed a complete perimeter levee from 1873 forward, encouraging agricultural efforts across the island. (Schulz and Farris 1994:104.)

Substantial settlement of the island was bolstered in 1874 with the founding of Isleton, southwest of the project area. Like the farming operations elsewhere on Andrus Island, Isleton had a strong economic focus on the asparagus crop. Isleton and area farmers realized greater growth and profits through the asparagus boom of the 1920s, manifesting in the construction of numerous canneries for commercial asparagus crops. Most canneries, despite the depredations of the Great Depression, operated into the 1930s and 1940s. (Schulz and Farris 1994:110–113.) Today, Isleton is best known for its annual crawdad festival and as a filming location for movies set in an old town (Crawford 2003:99).

## **Identified Cultural Resources**

### **CA-SAC-329**

CA-SAC-329 is a prehistoric midden site that contains a variety of features and artifacts: cooking stones, hearths, groundstone tools, baked clay implements, obsidian tools and waste flakes, animal bone, and human remains. The site, excavated in 1975, was found to be approximately 9 ft thick and overlain by 3–10 ft of fill and natural sediment. (Johnson and Johnson 1974:1; Soule 1976:19–21.) No evidence of archaeological materials was discernible at CA-SAC-329 during subsequent surveys because of the quantity of sediment covering the site (Dougherty 1991:1; Foster 1992:9–10). The Advisory Council on Historic Preservation, the State Historic Preservation Officer (SHPO), and the Corps consider CA-SAC-329 to be a historic property (Soule 1976:vi). The site, therefore, is considered a historic resource for the purposes of CEQA as well.

## Regulatory Setting

### Federal

Because the proposed project requires a Nationwide Permit No. 4 from the Corps, the proposed project is considered a federal undertaking and the Corps is the lead federal agency. Pursuant to federal regulations, prior to the approval of any federal undertaking, federal agencies must comply with Section 106 of the National Historic Preservation Act of 1966 (16 United States Code [USC] 470), as amended, and its implementing regulations, 36 CFR 800. Section 106 requires that, before beginning any undertaking, a federal agency must take into account the effects of the undertaking on historic properties and afford the Advisory Council on Historic Preservation (ACHP) an opportunity to comment on these actions. The Section 106 process has five basic steps:

1. Initiate the Section 106 process.
2. Identify and evaluate historic properties.
3. Assess effects of the project on historic properties within the undertaking's area of potential effects.
4. If historic properties are subject to adverse effects, the Corps, the SHPO, and any other consulting parties (including Indian tribes) continue consultation to seek ways to avoid, minimize, or mitigate the adverse effect. A memorandum of agreement (MOA) is usually developed to document the measures agreed upon to resolve the adverse effects.
5. Proceed in accordance with the terms of the MOA.

Specific regulations regarding compliance with Section 106 state that, although the tasks necessary to comply with Section 106 may be delegated to others, the federal agency (in this case, the Corps) is ultimately responsible for ensuring that the Section 106 process is completed according to statute (36 CFR 800.2[a]).

To determine whether an undertaking could affect NRHP-eligible properties, cultural resources (including archaeological, historical, and architectural properties) must be inventoried and evaluated for the NRHP. To be listed in the NRHP, a property must be 50 years old or older and possess significance (or if less than 50 years old, be of exceptional historic significance). To possess significance, a property must represent a significant theme or pattern in history, architecture, archaeology, engineering, or culture at the local, state, or national level. It must meet one or more of the following four criteria and have sufficient integrity to convey its historic significance. The criteria for evaluation of the eligibility of cultural resources for listing in the NRHP are defined in 36 CFR 60.4 as follows:

The quality of significance in American history, architecture, archaeology, engineering, and culture is present in districts, sites, buildings, structures, and objects that possess integrity of location, design, setting, materials, workmanship, feeling, and association, and

- A. that are associated with events that have made a significant contribution to the broad patterns of our history; or
- B. that are associated with the lives of persons significant in our past; or
- C. that embody the distinctive characteristics of a type, period or method of construction, or that represent the work of a master, or that possess high artistic value, or that represent a significant and distinguishable entity whose components may lack individual distinction; or

- D. that have yielded, or may be likely to yield, information important in prehistory or history.

In addition to meeting the significance criteria, potentially historic properties must possess integrity to be considered eligible for listing in the NRHP. Integrity refers to a property's ability to convey its historic significance (National Park Service 1991). Integrity is a quality that applies to historic resources in seven specific ways: location, design, setting, materials, workmanship, feeling, and association. A resource must retain sufficient aspects of integrity, depending on the context and the reasons the property is significant.

## State

CEQA requires that public agencies (in this case, DWR) that finance or approve public or private projects assess the impacts of the proposed project on cultural resources. CEQA requires that alternative plans or mitigation measures be considered if a project would result in significant impacts on important cultural resources. However, only impacts on significant cultural resources need to be addressed. Therefore, prior to the development of mitigation measures, the importance of cultural resources must be determined. The steps that normally are taken in a cultural resource investigation for CEQA compliance are listed below.

- Identify cultural resources.
- Evaluate the significance of resources.
- Evaluate the impacts of a project on all resources.
- Develop and implement measures to mitigate the impacts of the project only on significant resources, namely historical resources and unique archaeological resources (see definitions below).

The State CEQA Guidelines define three ways that a cultural resource may qualify as a historical resource for the purposes of CEQA review.

1. The resource is listed in or determined eligible for listing in the California Register of Historical Resources (CRHR).
2. The resource is included in a local register of historical resources, as defined in Public Resources Code (PRC) 5020.1(k), or is identified as significant in a historical resource survey meeting the requirements of PRC 5024.1(g) unless the preponderance of evidence demonstrates that it is not historically or culturally significant.
3. The lead agency determines the resource to be significant as supported by substantial evidence in light of the whole record (14 California Code of Regulations [CCR] 15064.5[a]).

A cultural resource may be eligible for inclusion in the CRHR if it:

1. is associated with events that have made a significant contribution to the broad patterns of California's history and cultural heritage;
2. is associated with the lives of persons important in our past;
3. embodies the distinctive characteristics of a type, period, region, or method of construction; represents the work of an important creative individual; or possesses high artistic values; or
4. has yielded, or may be likely to yield, information important in prehistory or history.

In addition, CEQA distinguishes between two classes of archaeological resources: archaeological resources that meet the above definition of a historical resource, and unique archaeological resources. An archaeological resource is considered unique if it:

- is associated with an event or person of recognized significance in California or American history or of recognized scientific importance in prehistory;
- can provide information that is of demonstrable public interest and is useful in addressing scientifically consequential and reasonable research questions; or
- has a special or particular quality such as oldest, best example, largest, or last surviving example of its kind. (PRC 21083.2.)

## Impacts and Mitigation Measures

### Federal Significance Criteria

Significant effects occur when those characteristics of a historic property that qualify it for inclusion in the NRHP are altered in a manner that would diminish the integrity of the property's location, design, setting, materials, workmanship, feeling, or association (36 CFR 800.5[a]). Significant effects are:

- physical destruction of or damage to all or part of the property;
- alteration of the property that is not consistent with the Secretary of the Interior's standards for the treatment of historic properties (36 CFR 68);
- removal of the property from its historic location;
- change of the character of the property's use or of physical features within the property's setting that contribute to its historic significance;
- introduction of visual, atmospheric, or audible elements that diminish the integrity of the property's significant historic features;
- neglect of a property that causes its deterioration; and
- transfer, lease, or sale of the property out of federal ownership or control.

### State Significance Criteria

According to the State CEQA Guidelines, a project has a significant effect on the environment when it may cause a substantial adverse change in the significance of a historic resource (14 CCR Section 15064.5[b]). CEQA further states that a *substantial adverse change in the significance of a resource* means the physical demolition, destruction, relocation, or alteration of the resource or its immediate surroundings such that the significance of a historic resource would be materially impaired. Actions that would materially impair the significance of a historic resource are those that would demolish or adversely alter those physical characteristics of a historical resource that convey its historical significance and qualify it for inclusion in the CRHR or in a local register or survey that meets the requirements of PRC Sections 5020.1(k) and 5024.1(g).

- a. Would the proposed project cause a substantial adverse change in the significance of a historical resource as defined in Section 15064.5?*
- b. Would the proposed project cause a substantial adverse change in the significance of a unique archaeological resource pursuant to Section 15064.5?*
- c. Would the proposed project disturb any human remains, including those interred outside of formal cemeteries?*

### **Impact CUL-1: Damage to or Destruction of a Historical Resource or Unique Archaeological Resource (Archaeological Site CA-SAC-329) as a Result of Landside Construction Activities**

Landside construction activities have the potential to damage or destroy archaeological site CA-SAC-329, which is considered a historic property under Section 106 and a historical resource under CEQA. Excavation of archaeological deposits from this site without scientific study of the materials would diminish the site's ability to convey information important to the study of regional prehistory, likely rendering CA-SAC-329 ineligible for listing on the NRHP or CRHR. Such damage or destruction would be an adverse effect under Section 106 and a significant impact under CEQA. Implementation of Mitigation Measure CUL-MM-1 below would reduce this impact to a less-than-significant level.

#### **Mitigation Measure CUL-MM-1: Limit Landside Excavation and Vegetation Removal to the First 3 Feet of Sediment and Monitor Landside Excavations Deeper than 3 Feet**

Archaeological site CA-SAC-329 is covered by at least 3 ft of non-archaeological sediment. Excavation and other ground disturbance to depths of 3 ft or less are unlikely to intersect CA-SAC-329. DWR or their agent will instruct the contractor not to excavate deeper than 3 ft for landside activities without consulting a DWR cultural resource specialist or a DWR-designated professional archaeologist. Landside excavations deeper than 3 ft will be monitored by a DWR archaeologist or a DWR-designated professional archaeologist. Implementation of this mitigation measure will reduce Impact CUL-1 to a less-than-significant level. If cultural resources are identified during monitoring, DWR will implement Mitigation Measure CUL-MM-2 (see below).

### **Impact CUL-2: Damage to or Destruction of As-Yet-Unidentified Cultural Resources, Including Human Remains**

Although a reasonable and good-faith effort has been made to identify cultural resources in the project area, construction activities in the project area still have the potential to encounter as-yet-unidentified cultural resources; submerged shipwrecks and archaeological sites obscured by surface vegetation or buried by fluvial sediments are not uncommon in Delta environs. Such cultural resources may qualify as historic properties, historical resources, or unique archaeological resources. Damage to or destruction of such resources would be an adverse effect under Section 106 and a significant impact under CEQA. Implementation of Mitigation Measure CUL-MM-2 would reduce this impact to a less-than-significant level.

#### **Mitigation Measure CUL-MM-2: Stop Work and Evaluate the Significance of Inadvertent Discoveries; Devise Treatment Measures as Needed**

In the event that a cultural resource is inadvertently discovered during construction of the proposed project, the construction contractor will stop work in the vicinity of the find and contact DWR. DWR

will authorize a qualified cultural resources specialist to assess the significance of the resources. If necessary, the cultural resource specialist also will develop appropriate treatment measures for the find. Evaluative work and treatment measures will be designed and carried out in accordance with state law and 36 CFR 800.13.

If human bone is found as a result of ground disturbance, the construction contractor will notify DWR, as well as the Sacramento County Coroner. If the coroner determines that the remains are of Native American origin, the coroner must contact the Native American Heritage Commission (NAHC) within 24 hours (California Health and Safety Code 7050[c]). The NAHC will identify and notify the most likely descendant (MLD) of the interred individual(s), who then will make a recommendation for means of treating or removing, with appropriate dignity, the human remains and any associated grave goods as provided in PRC 5097.98. The MLD will make their recommendation within approximately 48 hours of inspection of the remains. If the NAHC is unable to identify an MLD, if the MLD identified fails to make a recommendation, or if the landowner rejects the recommendation of the MLD, the landowner will inter the human remains and associated grave goods with appropriate dignity on the property in a location not subject to further and future subsurface disturbance. The proposed project is not on federal land, so the provisions of the federal Native American Graves Protection and Repatriation Act do not apply.

## VI. Geology and Soils

| VI. Geology and Soils  | Potentially<br>Significant<br>Impact | Less-than-<br>Significant with<br>Mitigation<br>Incorporated | Less-than-<br>Significant<br>Impact | No<br>Impact                        |
|--|--------------------------------------|--|-------------------------------------|-------------------------------------|
| Would the project:   |                                      |  |                                     |                                     |
| a. Expose people or structures to potential substantial adverse effects, including the risk of loss, injury, or death involving:   |                                      |  |                                     |                                     |
| 1. Rupture of a known earthquake fault, as delineated on the most recent Alquist-Priolo Earthquake Fault Zoning Map issued by the State Geologist for the area or based on other substantial evidence of a known fault? Refer to Division of Mines and Geology Special Publication 42. | <input type="checkbox"/>             | <input type="checkbox"/>                                     | <input checked="" type="checkbox"/> | <input type="checkbox"/>            |
| 2. Strong seismic ground shaking?  | <input type="checkbox"/>             | <input type="checkbox"/>                                     | <input checked="" type="checkbox"/> | <input type="checkbox"/>            |
| 3. Seismic-related ground failure, including liquefaction?   | <input type="checkbox"/>             | <input type="checkbox"/>                                     | <input checked="" type="checkbox"/> | <input type="checkbox"/>            |
| Landslides?  | <input type="checkbox"/>             | <input type="checkbox"/>                                     | <input type="checkbox"/>            | <input checked="" type="checkbox"/> |
| b. Result in substantial soil erosion or the loss of topsoil?  | <input type="checkbox"/>             | <input type="checkbox"/>                                     | <input checked="" type="checkbox"/> | <input type="checkbox"/>            |
| c. Be located on a geologic unit or soil that is unstable or that would become unstable as a result of the project and potentially result in an onsite or offsite landslide, lateral spreading, subsidence, liquefaction, or collapse?   | <input type="checkbox"/>             | <input type="checkbox"/>                                     | <input checked="" type="checkbox"/> | <input type="checkbox"/>            |
| d. Be located on expansive soil, as defined in Table 18-1-B of the Uniform Building Code (1994), creating substantial risks to life or property?   | <input type="checkbox"/>             | <input type="checkbox"/>                                     | <input checked="" type="checkbox"/> | <input type="checkbox"/>            |
| e. Have soils incapable of adequately supporting the use of septic tanks or alternative wastewater disposal systems in areas where sewers are not available for the disposal of wastewater?  | <input type="checkbox"/>             | <input type="checkbox"/>                                     | <input type="checkbox"/>            | <input checked="" type="checkbox"/> |
| f. Directly or indirectly destroy a unique paleontological resource or site or unique geologic feature?  | <input type="checkbox"/>             | <input type="checkbox"/>                                     | <input type="checkbox"/>            | <input checked="" type="checkbox"/> |

## Physical Setting

The soils in the proposed project area consist of Holocene flood plain and peat deposits and are relatively impervious with a high run-off potential (County of Sacramento 2010). The nearest faults are the Dunnigan Hills fault 22 miles to the north and the Vaca-Kirby Hills fault 25 miles to the east (EDAW/AECOMM 2006). Of these, only the Dunnigan Hills fault is active. However, due to the

alluvium soils, groundshaking and liquefaction could occur in this area. The proposed project area is located on expansive soils, but no landslide hazards exist in this area. Although the Sacramento River in this area has not been specifically surveyed for paleontological resources, there is a potential that they could be present in the proposed project area.

## Impacts and Mitigation Measures

- a. Would the proposed project expose people or structures to potential substantial adverse effects, including the risk of loss, injury, or death involving:*
  - 1. Rupture of a known earthquake fault, as delineated on the most recent Alquist-Priolo Earthquake Fault Zoning Map issued by the State Geologist for the area or based on other substantial evidence of a known fault? Refer to Division of Mines and Geology Special Publication 42.*
  - 2. Strong seismic ground shaking?*
  - 3. Seismic-related ground failure, including liquefaction?*
- c. Would the proposed project be located on a geologic unit or soil that is unstable or that would become unstable as a result of the project and potentially result in an onsite or offsite landslide, lateral spreading, subsidence, liquefaction, or collapse?*

### Impact GEO-1: Exposure of Barrier to Rupture, Groundshaking, and/or Liquefaction

Although the proposed project is located a substantial distance from any active faults, there is still a small potential for an earthquake to occur that could affect the proposed project area. Additionally, earthquakes could result in seismic groundshaking and liquefaction and spreading in this area because the soils in the proposed project area are composed of silts, clays, and peat deposits. The barrier structure would be located within the channel of the Sacramento River and would consist of up to 20 piles driven into the river bed. Should an earthquake occur, shaking, liquefaction and spreading could damage the structure. However, the structure is composed of several sections connected by the piles, which are each driven into the bed approximately 25 feet, and the barrier would be in place for less than 60 days. As such, the potential for substantial damage to the structure as a result of an earthquake, groundshaking, liquefaction, or spreading is minimal. Additionally, the barrier itself would not cause the area or surrounding areas to become unstable. This impact is less than significant and no mitigation is required.

- a. Would the proposed project expose people or structures to potential substantial adverse effects including the risk of loss, injury, or death involving:*
  - 4. Landslides?*

The proposed project is not located in an area subject to landslides, nor would the proposed project cause a landslide. All of the ground-disturbing work would occur within the river bed of the Sacramento River, with the exception of very minor work in the staging area, and there would be no permanent changes to the geology or soils in the area.

***b. Would the proposed project result in substantial soil erosion or the loss of topsoil?***

**Impact GEO-1: Increased Erosion during Construction and Removal of the Barrier**

During construction and removal of the barrier, landside construction activities including placement of operational equipment have the potential to cause slight increases in erosion. DWR will implement an erosion control plan as described in Chapter 2 to address erosion, stormwater runoff, sediment and other construction-related pollutants during project construction until all areas disturbed during construction have been permanently stabilized. The specific BMPs that would be included in the erosion control plan would be determined based on final design of the barrier and staging area, but would be designed in accordance with the RWQCB Field Manual. As such, this impact is less than significant and no mitigation is required.

***d. Would the proposed project be located on expansive soil, as defined in Table 18-1-B of the Uniform Building Code (1994), creating substantial risks to life or property?***

**Impact GEO-1: Risk to Barrier Structure as a Result of Soil Shrinking and Swelling**

Although the project may be located on expansive soils, the proposed project would not increase risks to life or property. The barrier would be located underwater, where shrink and swell potential does not exist. Land-based features of the proposed project would be temporary, would not disturb the ground, and would not be affected by minor shrinking and swelling that may occur during the 6-week period of operation of the barrier. As such, this impact is less than significant and no mitigation is required.

***e. Would the proposed project have soils incapable of adequately supporting the use of septic tanks or alternative wastewater disposal systems in areas where sewers are not available for the disposal of wastewater?***

The proposed project would not generate any new wastewater or require the construction or expansion of wastewater treatment facilities. As such, there would be no impact.

***f. Would the proposed project directly or indirectly destroy a unique paleontological resource or site or unique geologic feature?***

The proposed project would not result in any ground-disturbing activities except for the temporary placement of up to 20 piles in the middle of the Sacramento River. Although there is a potential for paleontological resource to exist in this location, the potential to encounter a paleontological resource is small because of the minimal amount of area that would be disturbed. As such, this impact is less than significant.

## VII. Greenhouse Gas Emissions

| VII. Greenhouse Gas Emissions |  | Potentially<br>Significant<br>Impact | Less-than-<br>Significant with<br>Mitigation<br>Incorporated | Less-than-<br>Significant<br>Impact | No<br>Impact             |
|-------------------------------|--|--------------------------------------|--|-------------------------------------|--------------------------|
| Would the project:            |  |                                      |  |                                     |                          |
| a.                            | Generate greenhouse gas emissions, either directly or indirectly, that may have a significant impact on the environment?       | <input type="checkbox"/>             | <input type="checkbox"/>                                     | <input checked="" type="checkbox"/> | <input type="checkbox"/> |
| b.                            | Conflict with an applicable plan, policy, or regulation adopted for the purpose of reducing the emissions of greenhouse gases? | <input type="checkbox"/>             | <input type="checkbox"/>                                     | <input checked="" type="checkbox"/> | <input type="checkbox"/> |

## Introduction and Methods

This section provides an analysis of climate change impacts resulting from the proposed project. It describes GHGs, discusses recent GHG inventories, and summarizes the current regulatory framework for GHG management. Environmental impacts related to climate change also are discussed. Please refer to Section 3 for a discussion of traditional air pollutants (e.g., CO, NO<sub>x</sub>, PM, etc.).

## Physical Setting

### Global Climate Change

Global climate change is caused in large part by anthropogenic (human-made) emissions of GHGs released into the atmosphere through the combustion of fossil fuels and other activities such as deforestation and land-use change. Unlike criteria air pollutants, which are discussed in Section 3, "Air Quality," GHGs tend to persist in the atmosphere where they can trap infrared radiation emitted from the earth's surface. This phenomenon, known as the greenhouse effect, is necessary to keep the earth's temperature warm enough for successful habitation by humans. Emissions of GHGs in excess of natural ambient concentrations, however, are responsible for the enhancement of the greenhouse effect. This trend of warming of the earth's natural climate is termed *global warming*.

### Greenhouse Gases

The principal GHGs contributing to global warming are CO<sub>2</sub>, CH<sub>4</sub>, N<sub>2</sub>O, and certain fluoridated compounds, and sulfur hexafluoride (SF<sub>6</sub>). Because construction and operation of the proposed project would generate primarily CO<sub>2</sub>, CH<sub>4</sub>, and N<sub>2</sub>O, the following discussion focuses on these pollutants.

CO<sub>2</sub> is the most important anthropogenic GHG, followed by CH<sub>4</sub> and N<sub>2</sub>O. It is estimated that CO<sub>2</sub> accounts for more than 75% of all anthropogenic GHG emissions. Three quarters of anthropogenic CO<sub>2</sub> emissions are the result of fossil-fuel burning (and to a very small extent, cement production), and approximately one quarter is the result of land-use change (Intergovernmental Panel on Climate

Change 2007a). CH<sub>4</sub> is the second largest contributor of anthropogenic GHG emissions and is the result of growing rice, raising cattle, combusting natural gas, and mining coal (National Oceanic and Atmospheric Administration 2005). N<sub>2</sub>O, while not as abundant as CO<sub>2</sub> or CH<sub>4</sub>, is a powerful GHG. Sources of N<sub>2</sub>O include agricultural processes, nylon production, fuel-fired power plants, nitric acid production, and vehicle emissions.

In order to simplify reporting and analysis, methods have been set forth to describe emissions of GHGs in terms of a single gas. The most commonly accepted method to compare GHG emissions is the global warming potential (GWP) methodology defined in the Intergovernmental Panel on Climate Change (IPCC) reference documents (Intergovernmental Panel on Climate Change 1996, 2001). The IPCC defines the GWP of various GHG emissions in terms of CO<sub>2</sub> equivalents (CO<sub>2</sub>e), where the mass of the gas in question is compared to that of the mass of CO<sub>2</sub> that would have the same warming potential (CO<sub>2</sub> has a GWP of 1 by definition). Refer to Appendix A for a discussion of the GWP for CO<sub>2</sub>, CH<sub>4</sub>, and N<sub>2</sub>O.

Table GHG-1 lists the GWP of CO<sub>2</sub>, CH<sub>4</sub>, N<sub>2</sub>O, their lifetimes, and abundances in the atmosphere in ppt.

**Table GHG-1. Lifetimes and Global Warming Potentials of Several GHGs**

| GHG              | Global Warming Potential (100 years) | Lifetime (years) | 1998 Atmospheric Abundance (ppt) <sup>a</sup> |
|------------------|--------------------------------------|------------------|---|
| CO <sub>2</sub>  | 1                                    | 50–200           | 365,000,000                                   |
| CH <sub>4</sub>  | 21                                   | 9–15             | 1,745   |
| N <sub>2</sub> O | 310                                  | 120              | 314   |

Source: Intergovernmental Panel on Climate Change 1996, 2001: 388–390.

Notes:

<sup>a</sup> 1 ppt is a mixing ratio unit indicating the concentration of a pollutant in parts per trillion by volume.

CO<sub>2</sub> = carbon dioxide.

CH<sub>4</sub> = methane

N<sub>2</sub>O = nitrous oxide.

## Greenhouse Gas Inventories

A GHG inventory is a quantification of all GHG emissions and sinks within a selected physical and/or economic boundary. GHG inventories can be performed on a large scale (e.g., for global and national entities) or on a small scale (e.g., for a particular building, project, or person). Although many processes are difficult to evaluate, several agencies have developed tools to quantify emissions from certain sources.

Table GHG-2 outlines the most recent global, national, statewide, and local GHG inventories to help put the magnitude of potential project-related emissions in perspective.

**Table GHG-2. Global, National, and State Greenhouse Gas Emissions Inventories**

| Emissions Inventory   | CO <sub>2</sub> e (metric tons) |
|---|---------------------------------|
| 2004 IPCC Global GHG Emissions Inventory  | 49,000,000,000                  |
| 2008 EPA National GHG Emissions Inventory   | 6,956,800,000                   |
| 2008 ARB State GHG Emissions Inventory  | 477,700,000                     |
| 2005 Sacramento County GHG Emissions Inventory  | 13,938,537                      |
| Sources: Intergovernmental Panel on Climate Change 2007b; U.S. Environmental Protection Agency 2010; California Air Resources Board 2010c; ICF Jones & Stokes 2009. |                                 |
| CO <sub>2</sub> e = carbon dioxide equivalents.   |                                 |
| GHG = greenhouse gas.   |                                 |

## Regulatory Setting

The climate change regulatory setting—nationally, statewide, and locally—is complex and evolving. The following section identifies key legislation, executive orders, and seminal court cases relevant to the environmental assessment of project GHG emissions.

### Federal

On December 7, 2009, the EPA issued its “endangerment” finding, in which the EPA Administrator found that current and projected concentrations of CO<sub>2</sub>, CH<sub>4</sub>, N<sub>2</sub>O, hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), and SF<sub>6</sub> threaten the public health and welfare of current and future generations. Additionally, the Administrator found that combined emissions from motor vehicles contribute to climate change. The EPA recently reconfirmed that “climate science is credible, compelling, and growing stronger” by denying 10 petitions challenging the Administrator’s 2009 decision.

The Council on Environmental Quality (CEQ) also has acknowledged the severity of global climate change and issued a memorandum providing guidance on consideration of the effects of climate change and GHG emissions under NEPA (Sutley 2010).

### State

A variety of legislation has been enacted in California relating to climate change, much of which sets aggressive goals for GHG reductions in the state. The most stringent of these are Executive Order S-3-05 and Assembly Bill 32 (AB32).

Executive Order S-3-05 is designed to reduce California’s GHG emissions to: (1) 2000 levels by 2010, (2) 1990 levels by the 2020, and (3) 80% below the 1990 levels by the year 2050. AB32 sets the same overall GHG emissions reduction goals as S-3-05 while further mandating that ARB create a plan that includes market mechanisms and implement rules to achieve “real, quantifiable, cost-effective reductions of greenhouse gases.” AB32 further directs state agencies and the newly created Climate Action Team (CAT) to identify discrete, early-action, GHG reduction measures, which were adopted in early 2010. These measures relate to truck efficiency, port electrification, tire inflation, and reduction of fluorinated compounds.

In addition to these goals, the State CEQA Guidelines recently were amended to require lead agencies to analyze a project’s GHG emissions. Moreover, the guidelines emphasize the necessity to

determine potential climate change effects of the project, and propose mitigation as necessary. The guidelines confirm the discretion of lead agencies to determine appropriate significance thresholds but require the preparation of an EIR if “there is substantial evidence that the possible effects of a particular project are still cumulatively considerable notwithstanding compliance with adopted regulations or requirements” (§15064.4).

## Local

### Sacramento Metropolitan Air Quality Management District

The SMAQMD’s CEQA Guidelines establish analysis expectations with regard to GHG emissions in CEQA documents (Sacramento Metropolitan Air Quality Management District 2009). The district recommends that an analysis of potential impacts of project-generated GHG emissions include a description of GHGs, summary of existing regulations, and a discussion of GHG emissions sources in the project area. The guidelines further state that the analysis quantifies the mass emissions associated with project construction and operations. Although the guidelines recommend that GHG emissions should be quantified, they do not establish set emissions thresholds. Rather, they state that the lead agency should determine a threshold appropriate to the project using either thresholds adopted by other agencies or their own. Finally, the SMAQMD requires that CEQA documents make a conclusion as to the significance of project-related GHG emissions and identify feasible mitigation measures.

## Impacts

It is unlikely that any single project by itself could have a significant impact on the environment. However, as discussed above, legislation and executive orders on the subject of climate change in California have established a statewide context for GHG emissions, and an enforceable statewide cap on GHG emissions. Because of the cumulative nature of the climate change problem, even relatively small contributions may be potentially considerable and therefore, significant. As a result, CEQA requires that the cumulative impacts of GHG, even additions that are relatively small on a global basis, need to be considered. Therefore, the analysis of the environmental effects of GHG emissions from this project will be addressed as a cumulative impact analysis.

DWR has not established a quantitative significance threshold for GHG emissions; instead each project is evaluated on a case by case basis using the most up to date calculation and analysis methods. At the time of this analysis, no other state or local air quality regulatory agency in California has adopted a significance threshold for GHG emissions generated by projects of this type. However, pursuant to AB32, the ARB requires stationary sources that generate greater than 25,000 metric tons of CO<sub>2</sub>e (MTCO<sub>2</sub>e) per year to report their GHG emissions. In addition, ARB released the *Preliminary Draft Staff Proposal: Recommended Approaches for Setting Interim Significance Thresholds for Greenhouse Gases under the California Environmental Quality Act*, which recommends GHG thresholds of significance for industrial and residential/ commercial projects. The preliminary interim threshold for industrial projects is 7,000 MTCO<sub>2</sub>e per year for operational emissions and compliance with performance standards for transportation and construction emissions. The threshold for residential and commercial projects is also based on performance standards (California Air Resources Board 2008).

It is not DWR's intention to establish 7,000 or 25,000 MTCO<sub>2</sub>e per year as a significance threshold. They are provided here only as a point of reference as to the order of magnitude of GHG emissions that might be considered significant or cumulatively considerable.

## Significance Criteria

The Appendix G of the amended CEQA guidelines includes the following GHG related questions:

- Would the project generate greenhouse gas emissions, either directly or indirectly, that may have a significant impact on the environment?
- Would the project conflict with an applicable plan, policy, or regulation adopted for the purpose of reducing the emissions of greenhouse gases?

Note that Appendix G is considered a set of sample questions. Thus additional factors, to be considered on a case by case basis, taking into consideration the project setting, may warrant looking beyond these questions<sup>5</sup>. Based on the size, scope, and purpose of this project the following significance criteria will be used to determine the significance of GHG emissions from this project:

- Whether the relative amounts of GHG emissions over the life of the proposed project are small in comparison to the amount of GHG emissions for major facilities that are required to report under AB32 and the federal Mandatory Greenhouse Gas Reporting Rule, and
  - Whether the project would conflict with the strategies discussed in the AB32 scoping plan
- a. Would the proposed project generate GHG emissions, either directly or indirectly, that may have a significant impact on the environment?***

## Impact CC-1: Generation of GHG Emissions from Project Construction and Operation

### Construction

Construction activities would generate short-term emissions of CO<sub>2</sub>, CH<sub>4</sub>, and N<sub>2</sub>O. Generation of these emissions would result from the use of heavy equipment, including cranes and watercraft, such as tugboats. As discussed in Section III, it was assumed that work crews would be on site approximately 2 weeks prior to construction to remove trash and debris. Installation and removal of the barrier would require 7 and 10 days, respectively.

Table GHG-3 presents a summary of total construction-related emissions. Detailed information on emission modeling and quantification methods may be found in Appendix B.

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<sup>5</sup> Reliance on AB 32 or other regulatory standards can serve as proxies for significance only to the extent that they accurately reflect the level at which an impact can be said to be less than significant. *See, e.g., Protect the Historic Amador Waterways v. Amador Water Agency*, (2004).116 Cal. App. 4th 1099, 1109.

**Table GHG-3. Summary of Construction-Related Greenhouse Gas Emissions (metric tons)<sup>a</sup>**

| Diesel Equipment |                 |                  | Gas-Powered Equipment |                    | Total CO <sub>2</sub> e |
|------------------|-----------------|------------------|-----------------------|--------------------|-------------------------|
| CO <sub>2</sub>  | CH <sub>4</sub> | N <sub>2</sub> O | CO <sub>2</sub>       | Other <sup>b</sup> |                         |
| 23.98            | 0.002           | 0.002            | 9.00                  | 0.49               | 34                      |

<sup>a</sup> Represents total emissions that would generated during site preparation, grading, installation, and removal.

<sup>b</sup> Includes CH<sub>4</sub>, N<sub>2</sub>O, and other trace GHGs emitted by gasoline-powered vehicles and boats.

CO<sub>2</sub> = carbon dioxide.

CH<sub>4</sub> = methane.

N<sub>2</sub>O = nitrous oxide.

CO<sub>2</sub>e = carbon dioxide equivalents.

As shown in Table GHG-3, implementation of the proposed project would result in 34 metric tons of CO<sub>2</sub>e. This is the equivalent of adding approximately 23 typical passenger cars to the road during the construction period (U.S. Environmental Protection Agency 2009).

### Operations

Operational emissions would be generated by vehicle travel and operation of the generator and air compressor<sup>6</sup>. Table GHG-4 presents a summary of total operations-related emissions. These emissions would only be emitted during the barrier operational period (less than 60 days). Detailed information on emission modeling and quantification methods may be found in Appendix B.

**Table GHG-4. Summary of Operational-Related Greenhouse Gas Emissions (metric tons)**

| Diesel Equipment <sup>a</sup> |                 |                  | Gas-Powered Equipment |                    | Total CO <sub>2</sub> e |
|-------------------------------|-----------------|------------------|-----------------------|--------------------|-------------------------|
| CO <sub>2</sub>               | CH <sub>4</sub> | N <sub>2</sub> O | CO <sub>2</sub>       | Other <sup>b</sup> |                         |
| 10.63                         | 0.001           | 0.000            | 1.57                  | 0.08               | 12                      |

<sup>a</sup> Generator and air compressor assumed to operate 24 hours per day every other day.

<sup>b</sup> Includes CH<sub>4</sub>, N<sub>2</sub>O, and other trace GHGs emitted by gasoline-powered vehicles.

CO<sub>2</sub> = carbon dioxide.

CH<sub>4</sub> = methane.

N<sub>2</sub>O = nitrous oxide.

CO<sub>2</sub>e = carbon dioxide equivalents.

As shown in Table GHG-4, operation of the proposed project will generate a *total* of 12 metric tons of CO<sub>2</sub>e. This is equivalent to adding eight typical passenger vehicles to the road during the less-than-60-day operational period (U.S. Environmental Protection Agency 2009).

### Summary of Construction and Operational Emissions

Based on Tables GHG-3 and GHG-4, implementation of the project will generate 45 metric tons of CO<sub>2</sub>e. The project does not include any energy efficient or GHG reduction strategies. However, emissions generated by the project are well below both the ARB Mandatory Reporting Threshold

<sup>6</sup> Please note that efforts are currently being undertaken to secure line power to the project site. This conduit has not yet been secured; therefore this analysis assumes operation of diesel-powered equipment.

and the 2008 ARB draft threshold. Because emissions are 2 and 3 orders of magnitude smaller than the ARB's reference points, this impact is considered less than significant and no mitigation is required.

***b. Would the proposed project conflict with any applicable plan, policy, or regulation adopted for the purpose of reducing the emissions of greenhouse gases?***

**Impact CC-2: Conflict with Applicable GHG Reduction Plan or Regulation**

California has adopted several policies and regulations for the purpose of reducing GHG emissions. The most stringent of these is AB32, which is designated to reduce statewide GHG emissions to 1990 levels by 2020. The AB32 Scoping Plan outlines strategies the State will employ to achieve this goal. These strategies are geared towards sectors and activities that generate significant amounts of GHGs. For example, the majority of measures address building energy, waste and wastewater generation, goods movement, on-road transportation, water usage, and high global warming potential gases. The proposed project includes installation and removal of a non-physical barrier. Activities associated with the project are not considered by the AB32 Scoping Plan as having a high potential to emit GHGs. Consequently, none of the AB32 reduction strategies are applicable to the project. Implementation of the project will therefore not conflict with implementation of AB32. This impact is considered less than significant.

## VIII. Hazards and Hazardous Materials

| VIII. Hazards and Hazardous Materials   | Potentially Significant Impact | Less-than-Significant with Mitigation Incorporated | Less-than-Significant Impact        | No Impact                           |
|---|--------------------------------|--|-------------------------------------|-------------------------------------|
| Would the project:  |                                |  |                                     |                                     |
| a. Create a significant hazard to the public or the environment through the routine transport, use, or disposal of hazardous materials?   | <input type="checkbox"/>       | <input type="checkbox"/>                           | <input checked="" type="checkbox"/> | <input type="checkbox"/>            |
| b. Create a significant hazard to the public or the environment through reasonably foreseeable upset and accident conditions involving the release of hazardous materials into the environment?   | <input type="checkbox"/>       | <input type="checkbox"/>                           | <input checked="" type="checkbox"/> | <input type="checkbox"/>            |
| c. Emit hazardous emissions or involve handling hazardous or acutely hazardous materials, substances, or waste within one-quarter mile of an existing or proposed school?   | <input type="checkbox"/>       | <input type="checkbox"/>                           | <input checked="" type="checkbox"/> | <input type="checkbox"/>            |
| d. Be located on a site that is included on a list of hazardous materials sites compiled pursuant to Government Code Section 65962.5 and, as a result, would it create a significant hazard to the public or the environment?                   | <input type="checkbox"/>       | <input type="checkbox"/>                           | <input type="checkbox"/>            | <input checked="" type="checkbox"/> |
| e. Be located within an airport land use plan area or, where such a plan has not been adopted, be within two miles of a public airport or public use airport, and result in a safety hazard for people residing or working in the project area? | <input type="checkbox"/>       | <input type="checkbox"/>                           | <input checked="" type="checkbox"/> | <input type="checkbox"/>            |
| f. Be located within the vicinity of a private airstrip and result in a safety hazard for people residing or working in the project area?   | <input type="checkbox"/>       | <input type="checkbox"/>                           | <input checked="" type="checkbox"/> | <input type="checkbox"/>            |
| g. Impair implementation of or physically interfere with an adopted emergency response plan or emergency evacuation plan?   | <input type="checkbox"/>       | <input type="checkbox"/>                           | <input checked="" type="checkbox"/> | <input type="checkbox"/>            |
| h. Expose people or structures to a significant risk of loss, injury, or death involving wildland fires, including where wildlands are adjacent to urbanized areas or where residences are intermixed with wildlands?                           | <input type="checkbox"/>       | <input type="checkbox"/>                           | <input checked="" type="checkbox"/> | <input type="checkbox"/>            |

## Physical Setting

The proposed project is located in a predominantly agricultural area, and use of pesticides, herbicides, fuels, and other hazardous materials is associated with this land use. However, the proposed project is not located on any hazardous site lists. The community of Walnut Grove is adjacent to the project area and within it, there is one school—Walnut Grove Elementary. This

school is located approximately ¼ mile northeast of the project area. The Thornton-Walnut Grove Gas Field is located east of Walnut Grove. At least one airstrip/airport is located within 2 miles of the proposed project (Spezia Airport) (City-Data.com 2010). This airport serves small, private planes and does not have excessive air traffic. Other landing strips, used during agricultural activities, may exist within 2 miles of the proposed project.

## Impacts and Mitigation Measures

- a. Would the proposed project create a significant hazard to the public or the environment through the routine transport, use, or disposal of hazardous materials?*
- b. Would the proposed project create a significant hazard to the public or the environment through reasonably foreseeable upset and accident conditions involving the release of hazardous materials into the environment?*
- c. Would the proposed project emit hazardous emissions or involve handling hazardous or acutely hazardous materials, substances, or waste within one-quarter mile of an existing or proposed school?*

### Impact HAZ-1: Temporary Increase in Use of Fuels and Other Lubricants

The proposed project would not require long-term storage, treatment, disposal, or transport of hazardous materials. However, small quantities of hazardous materials (fuels, lubricants) would be stored in the staging area and used by the construction equipment, generators, and vehicles entering and exiting the site. Additionally, these materials are not considered acutely hazardous and would not pose a substantial risk to human health and/or safety, nor would an accidental spill affect Walnut Grove Elementary School, which is located upstream of the project area. Additionally, emissions from construction and operations activities would be temporary and typical of a small construction activity. (Impacts related to air quality are described in greater detail above.) These materials may be handled temporarily on the site, but accidental spills and releases would be avoided or minimized through the implementation of an HMMP, as described in Chapter 2, Environmental Commitments.

- d. Would the proposed project be located on a site that is included on a list of hazardous materials sites compiled pursuant to Government Code Section 65962.5 and, as a result, would it create a significant hazard to the public or the environment?*

The proposed project is not located on any sites known to contain hazardous materials or waste. Additionally, minimal ground-disturbing activities would occur that have the potential to disrupt such areas. There would be no impact.

- e. Would the proposed project be located within an airport land use plan area or, where such a plan has not been adopted, be within two miles of a public airport or public use airport, and result in a safety hazard for people residing or working in the project area?*
- f. Would the proposed project be located within the vicinity of a private airstrip and result in a safety hazard for people residing or working in the project area?*

### **Impact HAZ-2: Increased Risks to Workers as a Result of Proximity to Airstrips**

The few workers that would be present during the construction and operation of the barrier, combined with rural nature of the project area and the lack of major airports in the vicinity, would result in very little increased risk to these workers. This impact is less than significant, and no mitigation is required.

- g. Would the proposed project impair implementation of or physically interfere with an adopted emergency response plan or emergency evacuation plan?*

The proposed project would not impede navigation in the channels or roadways and would not affect the ability of emergency response vehicles or efforts to respond to emergencies. Few construction and other vehicles would be added to roadways, and the changes would be limited to less than a 4-month period. As such, there would be no impact.

- h. Would the proposed project expose people or structures to a significant risk of loss, injury, or death involving wildland fires, including where wildlands are adjacent to urbanized areas or where residences are intermixed with wildlands?*

### **Impact HAZ-3: Increased Risk of Fire during Construction and Operation of the Barrier**

The use of generators, construction equipment and other machinery on the land has the potential to slightly increase the risk of fire in the project area. However, as described in Chapter 2, Environmental Commitments, an HMMP would be implemented to minimize/eliminate this risk. Additionally, the land area surrounding the staging area is used for agriculture, and there are no structures, including residences, that would be at risk should fire occur. As such, this impact would be less than significant, and no mitigation is required.

## IX. Hydrology and Water Quality

| IX. Hydrology and Water Quality |  | Potentially<br>Significant<br>Impact | Less-than-<br>Significant with<br>Mitigation<br>Incorporated | Less-than-<br>Significant<br>Impact | No<br>Impact                        |
|---------------------------------|--|--------------------------------------|--|-------------------------------------|-------------------------------------|
| Would the project:              |  |                                      |  |                                     |                                     |
| a.                              | Violate any water quality standards or waste discharge requirements?   | <input type="checkbox"/>             | <input type="checkbox"/>                                     | <input checked="" type="checkbox"/> | <input type="checkbox"/>            |
| b.                              | Substantially deplete groundwater supplies or interfere substantially with groundwater recharge, resulting in a net deficit in aquifer volume or a lowering of the local groundwater table level (e.g., the production rate of pre-existing nearby wells would drop to a level that would not support existing land uses or planned uses for which permits have been granted)? | <input type="checkbox"/>             | <input type="checkbox"/>                                     | <input type="checkbox"/>            | <input checked="" type="checkbox"/> |
| c.                              | Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, in a manner that would result in substantial erosion or siltation onsite or offsite?   | <input type="checkbox"/>             | <input type="checkbox"/>                                     | <input checked="" type="checkbox"/> | <input type="checkbox"/>            |
| d.                              | Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, or substantially increase the rate or amount of surface runoff in a manner that would result in flooding onsite or offsite?  | <input type="checkbox"/>             | <input type="checkbox"/>                                     | <input checked="" type="checkbox"/> | <input type="checkbox"/>            |
| e.                              | Create or contribute runoff water that would exceed the capacity of existing or planned stormwater drainage systems or provide substantial additional sources of polluted runoff?  | <input type="checkbox"/>             | <input type="checkbox"/>                                     | <input type="checkbox"/>            | <input checked="" type="checkbox"/> |
| f.                              | Otherwise substantially degrade water quality?   | <input type="checkbox"/>             | <input type="checkbox"/>                                     | <input checked="" type="checkbox"/> | <input type="checkbox"/>            |
| g.                              | Place housing within a 100-year flood hazard area, as mapped on a federal Flood Hazard Boundary or Flood Insurance Rate Map or other flood hazard delineation map?   | <input type="checkbox"/>             | <input type="checkbox"/>                                     | <input type="checkbox"/>            | <input checked="" type="checkbox"/> |
| h.                              | Place within a 100-year flood hazard area structures that would impede or redirect floodflows?   | <input type="checkbox"/>             | <input type="checkbox"/>                                     | <input checked="" type="checkbox"/> | <input type="checkbox"/>            |
| i.                              | Expose people or structures to a significant risk of loss, injury, or death involving flooding, including flooding as a result of the failure of a levee or dam?   | <input type="checkbox"/>             | <input type="checkbox"/>                                     | <input checked="" type="checkbox"/> | <input type="checkbox"/>            |
| j.                              | Contribute to inundation by seiche, tsunami, or mudflow?   | <input type="checkbox"/>             | <input type="checkbox"/>                                     | <input type="checkbox"/>            | <input checked="" type="checkbox"/> |

## Physical Setting

The nearest water monitoring stations are located in Georgiana Slough at Sacramento River (Station GSS) and in Sacramento River just downstream of Georgiana Slough (Station GES). At station GSS, flows ranged from -0.22 feet per second (fps) to 2.5 fps, with an average of about 1 fps in the last year. At station GES, flows ranged from -1.17 fps to 3.4 fps, with an average of about 1 fps in the last year. Turbidity in the Sacramento River and Georgiana Slough is approximately 25 Nephelometric turbidity units (NTUs) on average throughout most the year, but tends to be slightly higher in spring months during periods of greater flows. Flood season in the Sacramento River is typically November 1 through April 15.

The EPA and the Central Valley Regional Water Quality Control Board (RWQCB) have classified the central Delta as 303(d) impaired for chlorpyrifos, DDT, diazinon, exotic species, Group A pesticides<sup>7</sup>, mercury, and unknown toxicants (State Water Resources Control Board 2006).

## Regulatory Setting

### Federal

#### Clean Water Act

The federal Clean Water Act (CWA) is the primary federal law that protects the quality of the nation's surface waters, including lakes, rivers, and coastal wetlands. It operates on the principle that all discharges into the nation's waters are unlawful unless specifically authorized by a permit; permit review is the CWA's primary regulatory tool. The following paragraphs provide additional details on specific sections of the CWA.

#### Clean Water Act Permits for Fill Placement in Waters and Wetlands

CWA Section 404 regulates the discharge of dredged and fill materials into "waters of the United States," which include oceans, bays, rivers, streams, lakes, ponds, and wetlands. Project proponents must obtain a permit from the Corps for all discharges of dredged or fill material into waters of the United States, including wetlands, before proceeding with a proposed activity.

#### Clean Water Act Permits for Stormwater Discharge

CWA Section 402 regulates construction related stormwater discharges to surface waters through the National Pollutant Discharge Elimination System (NPDES) program, administered by the EPA. In California, the State Water Resources Control Board (State Water Board) is authorized by the EPA to oversee the NPDES program through the RWQCBs. (See related discussion under "Porter-Cologne Water Quality Control Act" below.) The NPDES program provides for both general permits (i.e., those that cover a number of similar or related activities) and individual permits.

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<sup>7</sup> Group A pesticides include aldrin, dieldrin, endrin, endosulfan, heptachloroepoxide, toxaphene, chlordane, lindane, and heptachlor

## State

### Porter-Cologne Water Quality Control Act

The Porter-Cologne Water Quality Control Act (Porter-Cologne Act), passed in 1969, articulates with the CWA (see “Clean Water Act” above). The project area is under the jurisdiction of the CVRWQCB (Region 5).

### Water Quality Objectives

The RWQCBs have set water quality objectives for all surface waters in their respective regions for the following substances and parameters: ammonia, bacteria, biostimulatory substances, chemical constituents, color, dissolved oxygen, floating material, oil and grease, pH, pesticides, radioactivity, salinity, sediment, settleable material, suspended material, tastes and odors, temperature, toxicity, and turbidity. Specific objectives for concentrations of chemical constituents are applied to bodies of water based on their designated beneficial uses (Central Valley Regional Water Quality Control Board 1998). The primary issue associated with the proposed project is turbidity. The Basin Plan includes the following objectives regarding turbidity:

For Delta waters, the general objectives for turbidity apply subject to the following: except for periods of storm runoff, the turbidity of Delta waters shall not exceed 50 NTUs in the waters of the Central Delta and 150 NTUs in other Delta waters. Exceptions to the Delta specific objectives will be considered when a dredging operation can cause an increase in turbidity. In this case, an allowable zone of dilution within which turbidity in excess of limits can be tolerated will be defined for the operation and prescribed in a discharge permit.

Additionally, where natural turbidity is between 5 and 50 NTUs, increases shall not exceed 20 percent.

## Impacts and Mitigation Measures

- a. Would the proposed project violate any water quality standards or waste discharge requirements?*
- c. Would the proposed project substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, in a manner that would result in substantial erosion or siltation onsite or offsite?*
- f. Would the proposed project otherwise substantially degrade water quality?*

### Impact WQ-1: Temporary Increased Turbidity during Construction

Construction of the barrier will require ground-disturbing work within and adjacent to the Sacramento River. Specifically, pile-driving has the potential to temporarily increase turbidity in the immediate vicinity of the barrier. Pile-driving is expected to occur over a period of up to 2 days and each of the 20 piles would be driven one at a time. There would also be approximately 1 hour between each pile-driving activity, thus reducing the potential for the pile-driving to result in an additive effect in the river. The placement of the barge spuds, as well tug and barge movement associated with placement of the barrier frames, would also temporarily disturb the channel bottom and therefore temporarily increase turbidity in the project area. The construction of the barrier would occur in the late winter (February), when turbidity levels are approaching their highest as a

result of high flows. As such, it is not expected that the construction activities would result in any noticeable change in turbidity. However, as described in the Environmental Commitments section of Chapter 2, DWR will implement turbidity monitoring downstream of the project area and adjust operations if turbidity levels increase by more than 20%, a threshold derived from the Sacramento and San Joaquin Rivers Basin Plan (Central Valley Regional Water Quality Control Board 1998), compared to upstream measurements. As such, this impact is less than significant and no mitigation is required.

### **Impact WQ-2: Inadvertent Release of Hazardous Materials to Adjacent Water Body during Construction**

The proposed project would include the use of fuels and lubricants to operate construction and other machinery and equipment. Equipment could be on barges and/or on land and the potential for accidental spills exists. The adoption of an erosion control plan and an HMMP, as described in the Environmental Commitments section of Chapter 2, would provide measures to avoid, minimize, and contain such accidental spills, thus minimizing the potential for impacts on water quality. As such, this impact is less than significant and no mitigation is required.

### **Impact WQ-3: Accelerated Erosion during Construction**

Ground-disturbing activities in the staging and loading areas and along the riverbank could result in slight increased erosion into the Sacramento River during construction. These activities would be very minimal, limited to a small area adjacent to the barrier site, and would occur over a short period of time (approximately 2 weeks for construction, including site cleaning, minor grading as necessary, setup, frame assembly, and barrier installation, and 10 days for removal). Additionally, an erosion control plan and an HMMP would be prepared and implemented as described in the Environmental Commitments section of Chapter 2 that would include measures to minimize storm-water runoff, erosion, sedimentation and other construction-related pollutants. As such, this impact is less than significant and no mitigation is required.

***b. Would the proposed project substantially deplete groundwater supplies or interfere substantially with groundwater recharge, resulting in a net deficit in aquifer volume or a lowering of the local groundwater table level (e.g., the production rate of pre-existing nearby wells would drop to a level that would not support existing land uses or planned uses for which permits have been granted)?***

The proposed project would not use or affect groundwater supplies. Additionally, none of the project features would interfere with groundwater recharge. There would be no impact.

***e. Would the proposed project create or contribute runoff water that would exceed the capacity of existing or planned stormwater drainage systems or provide substantial additional sources of polluted runoff?***

The proposed project would not create new runoff. There would be no impact.

***g. Would the proposed project place housing within a 100-year flood hazard area, as mapped on a federal Flood Hazard Boundary or Flood Insurance Rate Map or other flood hazard delineation map?***

The proposed project would not include any new or altered housing. There would be no impact.

- d. Would the proposed project substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, or substantially increase the rate or amount of surface runoff in a manner that would result in flooding onsite or offsite?*
- h. Would the proposed project place within a 100-year flood hazard area structures that would impede or redirect floodflows?*
- i. Would the proposed project expose people or structures to a significant risk of loss, injury, or death involving flooding, including flooding as a result of the failure of a levee or dam?*

#### **Impact WQ-4: Placement of Structures in Floodplain**

The proposed project includes minimal land-based facilities adjacent to the Sacramento River and a barrier structure in the river. The barrier structure is being designed to accommodate flood flows in the Sacramento River and is not of substantial volume compared to the channel volume to cause an increased risk of flooding or reduction in channel capacity. Similarly, the land-based facilities are relatively small and would not impede, redirect, or cause flood flows. As such, this impact is less than significant and no mitigation is required.

- j. Would the proposed project contribute to inundation by seiche, tsunami, or mudflow?*

The location of the barriers is located within the northern portion of the Bay-Delta and is not subject to mudflow. The project would not increase the potential for seiche or tsunami to occur and would not increase populations located with an area subject to seiche or tsunami. There would be no impact.

## X. Land Use and Planning

| X. Land Use and Planning   | Potentially<br>Significant<br>Impact | Less-than-<br>Significant with<br>Mitigation<br>Incorporated | Less-than-<br>Significant<br>Impact | No<br>Impact                        |
|--|--------------------------------------|--|-------------------------------------|-------------------------------------|
| Would the project:   |                                      |  |                                     |                                     |
| a. Physically divide an established community?   | <input type="checkbox"/>             | <input type="checkbox"/>                                     | <input type="checkbox"/>            | <input checked="" type="checkbox"/> |
| b. Conflict with any applicable land use plan, policy, or regulation of an agency with jurisdiction over the project (including, but not limited to, a general plan, specific plan, local coastal program, or zoning ordinance) adopted for the purpose of avoiding or mitigating an environmental effect? | <input type="checkbox"/>             | <input type="checkbox"/>                                     | <input type="checkbox"/>            | <input checked="" type="checkbox"/> |
| c. Conflict with any applicable habitat conservation plan or natural community conservation plan?  | <input type="checkbox"/>             | <input type="checkbox"/>                                     | <input type="checkbox"/>            | <input checked="" type="checkbox"/> |

Walnut Grove is located adjacent to the proposed project and is located in unincorporated Sacramento County. Sacramento County planning has zoned Walnut Grove as a Special Planning Area, primarily to protect historic resources. Land surrounding the project area is zoned for industrial, residential, commercial, and agricultural uses. The proposed project would not interfere with the intended uses of these areas, or conflict with any land use or habitat plans in place. The staging and loading areas are located on an area zoned for agriculture; however, no agricultural production is occurring in this area, and staging in this area would not preclude future agricultural uses. As such, there would be no impacts on land uses.

## XI. Mineral Resources

| XI. Mineral Resources |   | Potentially<br>Significant<br>Impact | Less-than-<br>Significant with<br>Mitigation<br>Incorporated | Less-than-<br>Significant<br>Impact | No<br>Impact                        |
|-----------------------|---|--------------------------------------|--|-------------------------------------|-------------------------------------|
| Would the project:    |   |                                      |  |                                     |                                     |
| a.                    | Result in the loss of availability of a known mineral resource that would be of value to the region and the residents of the state?                                 | <input type="checkbox"/>             | <input type="checkbox"/>                                     | <input type="checkbox"/>            | <input checked="" type="checkbox"/> |
| b.                    | Result in the loss of availability of a locally important mineral resource recovery site delineated on a local general plan, specific plan, or other land use plan? | <input type="checkbox"/>             | <input type="checkbox"/>                                     | <input type="checkbox"/>            | <input checked="" type="checkbox"/> |

The proposed project is a temporary, 1-year pilot study that would be removed upon completion of the experiment in spring 2011. Minimal ground-disturbing activities would occur, and no permanent features would be installed that would prohibit the future extraction of mineral resources, should they exist at the site. No plans reviewed indicate that there are known mineral resources in the project area. As such, there is no impact.

## XII. Noise

| XII. Noise  | Potentially<br>Significant<br>Impact | Less-than-<br>Significant with<br>Mitigation<br>Incorporated | Less-than-<br>Significant<br>Impact | No<br>Impact                        |
|---|--------------------------------------|--|-------------------------------------|-------------------------------------|
| Would the project:  |                                      |  |                                     |                                     |
| a. Expose persons to or generate noise levels in excess of standards established in a local general plan or noise ordinance or applicable standards of other agencies?  | <input type="checkbox"/>             | <input checked="" type="checkbox"/>                          | <input type="checkbox"/>            | <input type="checkbox"/>            |
| b. Expose persons to or generate excessive groundborne vibration or groundborne noise levels?   | <input type="checkbox"/>             | <input type="checkbox"/>                                     | <input checked="" type="checkbox"/> | <input type="checkbox"/>            |
| c. Result in a substantial permanent increase in ambient noise levels in the project vicinity above levels existing without the project?  | <input type="checkbox"/>             | <input type="checkbox"/>                                     | <input type="checkbox"/>            | <input checked="" type="checkbox"/> |
| d. Result in a substantial temporary or periodic increase in ambient noise levels in the project vicinity above levels existing without the project?  | <input type="checkbox"/>             | <input checked="" type="checkbox"/>                          | <input type="checkbox"/>            | <input type="checkbox"/>            |
| e. Be located within an airport land use plan area, or, where such a plan has not been adopted, within two miles of a public airport or public use airport and expose people residing or working in the project area to excessive noise levels? | <input type="checkbox"/>             | <input type="checkbox"/>                                     | <input checked="" type="checkbox"/> | <input type="checkbox"/>            |
| f. Be located in the vicinity of a private airstrip and expose people residing or working in the project area to excessive noise levels?  | <input type="checkbox"/>             | <input type="checkbox"/>                                     | <input checked="" type="checkbox"/> | <input type="checkbox"/>            |

## Introduction and Methods

### Noise Fundamentals

Noise is commonly defined as unwanted sound that annoys or disturbs people and potentially causes an adverse psychological or physiological effect on human health. Because noise is an environmental pollutant that can interfere with human activities, evaluation of noise is necessary when considering the environmental impacts of a proposed project.

Sound is mechanical energy (vibration) transmitted by pressure waves through a medium such as air or water. Noise generally is defined as unwanted sound that annoys or disturbs people. Sound is characterized by various parameters that include the rate of oscillation of sound waves (frequency), the speed of propagation, and the sound pressure amplitude. The sound pressure level is the most common descriptor used to characterize the loudness of sound. The dB scale, a logarithmic scale, is used to quantify sound intensity. Because human hearing is more sensitive to frequencies in the high

end of the frequency spectrum than frequencies in the low end, sound levels used to describe environmental noise typically are weighted to deemphasize frequencies in the low end of the frequency spectrum. This decibel weighting is called *A-weighting* (dBA).

Table NOI-1 summarizes typical A-weighted sound levels for different noise sources.

**Table NOI-1. Typical A-weighted Sound Levels**

| Common Outdoor Activities         | Noise Level (dBA) | Common Indoor Activities                               |
|-----------------------------------|-------------------|--|
|                                   | 110               | Rock band  |
| Jet flyover at 1,000 feet         | 100               |  |
| Gas lawnmower at 3 feet           | 90                |  |
| Diesel truck at 50 feet at 50 mph | 80                | Food blender at 3 feet<br>Garbage disposal at 3 feet   |
| Noisy urban area, daytime         | 70                | Vacuum cleaner at 10 feet<br>Normal speech at 3 feet   |
| Gas lawnmower, 100 feet           | 60                |  |
| Commercial area                   | 50                | Large business office<br>Dishwasher in next room       |
| Heavy traffic at 300 feet         | 40                | Theater, large conference room (background)            |
| Quiet urban daytime               | 30                | Library<br>Bedroom at night, concert hall (background) |
| Quiet urban nighttime             | 20                |  |
| Quiet suburban nighttime          | 10                | Broadcast/recording studio                             |
| Quiet rural nighttime             | 0                 |  |

Source: California Department of Transportation 2009.

In general, human sound perception is such that a change in sound level of 1 dB typically cannot be perceived by the human ear, a change of 3 dB is just noticeable, a change of 5 dB is clearly noticeable, and a change of 10 dB is perceived as doubling or halving the sound level.

Different types of measurements are used to characterize the time-varying nature of sound. These measurements include the equivalent sound level ( $L_{eq}$ ), the minimum and maximum sound levels ( $L_{min}$  and  $L_{max}$ ), percentile-exceeded sound levels (such as  $L_{10}$ ,  $L_{20}$ ), the day-night sound level ( $L_{dn}$ ), and the community noise equivalent level (CNEL).  $L_{dn}$  and CNEL values differ by less than 1 dB. As a matter of practice,  $L_{dn}$  and CNEL values are considered to be equivalent and are treated as such in this assessment. Table NOI-2 provides definitions of sound measurements and other terminology used in this chapter.

**Table NOI-2. Definition of Sound Measurements**

| Sound Measurements                           | Definition  |
|--|---|
| Decibel (dB)                                 | A unitless measure of sound on a logarithmic scale, which indicates the squared ratio of sound pressure amplitude to a reference sound pressure amplitude. The reference pressure is 20 micro-pascals.  |
| A-Weighted Decibel (dBA)                     | An overall frequency-weighted sound level in decibels that approximates the frequency response of the human ear.  |
| Maximum Sound Level ( $L_{max}$ )            | The maximum sound level measured during the measurement period.   |
| Minimum Sound Level ( $L_{min}$ )            | The minimum sound level measured during the measurement period.   |
| Equivalent Sound Level ( $L_{eq}$ )          | The equivalent steady state sound level that in a stated period of time would contain the same acoustical energy as a time-varying sound level.   |
| Percentile-Exceeded Sound Level ( $L_{xx}$ ) | The sound level exceeded “x”% of a specific time period. $L_{10}$ is the sound level exceeded 10% of the time. $L_{90}$ is the sound level exceeded 90% of the time. $L_{90}$ is often considered to be representative of the background noise level in a given area.                               |
| Day-Night Level ( $L_{dn}$ )                 | The energy average of the A-weighted sound levels occurring during a 24-hour period, with 10 dB added to the A-weighted sound levels occurring during the period from 10:00 p.m. to 7:00 a.m.   |
| Community Noise Equivalent Level (CNEL)      | The energy average of the A-weighted sound levels occurring during a 24-hour period with 5 dB added to the A-weighted sound levels occurring during the period from 7:00 p.m. to 10:00 p.m. and 10 dB added to the A-weighted sound levels occurring during the period from 10:00 p.m. to 7:00 a.m. |
| Frequency: Hertz (Hz)                        | The number of complete pressure fluctuations per second above and below atmospheric pressure.   |

For a point source such as a stationary compressor or construction equipment, sound attenuates based on geometry at rate of 6 dB per doubling of distance. For a line source such as free-flowing traffic on a freeway, sound attenuates at a rate of 3 dB per doubling of distance. Atmospheric conditions such as wind, temperature gradients, and humidity can change how sound propagates over distance and can affect the level of sound received at a given location. The degree to which the ground surface absorbs acoustical energy also affects sound propagation. Sound that travels over an acoustically absorptive surface such as grass attenuates at a greater rate than sound that travels over a hard surface such as pavement. The increased attenuation is typically about 1.5 per doubling of distance (California Department of Transportation 2009). Barriers such as buildings and topography that block the line of sight between a source and receiver also increase the attenuation of sound over distance.

## Methods

Noise impacts are evaluated by developing estimates of noise source levels associated with construction and operation of the barrier. Estimates of potential noise levels at nearby noise-sensitive uses then are developed using point-source attenuation. Because project-related sound would travel primarily over water, no attenuation from ground absorption is included in the calculations. The predicted noise levels then are compared to Sacramento County noise standards to identify potential noise impacts.

## Physical Setting

The project area is located in a rural unincorporated area of Sacramento County, just south of Walnut Grove. Noise-sensitive uses in the project area include several residences located on the southeast side of the Sacramento River and two residences on the north side of the river. The barrier will be located as close as about 200 feet from residences on the southeast side of the river. The main staging area and barrier control equipment will be located at the west end of the barrier on the west side of Georgiana Slough where it connects to the Sacramento River. The two residences on the north side of the river are about 800 feet from the staging/control area, and residences on the southeast side of the river are as close as about 400 feet.

Existing noise levels are governed primarily by traffic on local roadways, boating activity on the river, and nearby agricultural activities. Existing noise levels in a small town environment such as this are typically in the range of 45 to 55  $L_{dn}$  (Cowan 1994).

## Regulatory Setting

Section 6.68.070 of the Sacramento County Code identifies exterior noise standards. The exterior noise standard is 55 dBA between the hours of 7:00 a.m. and 10:00 p.m. and 50 dBA between the hours of 10:00 p.m. and 7:00 a.m. for noise that occurs for a cumulative of 30 minutes or more per hour. These standards are adjusted as follows for events with lesser duration:

- Cumulative period of 15 minutes or less: +5 dB
- Cumulative period of 5 minutes or less: +10 dB
- Cumulative period of 1 minutes or less: +15 dB
- Level not to be exceeded for any time per hour: +20 dB

Noise sources associated with construction are exempt from these noise standards during daytime hours and are applied only to the hours between 8:00 p.m. and 6:00 a.m. on weekdays and Friday commencing at 8:00 p.m. through 7:00 a.m. Saturday, Saturdays commencing at 8:00 p.m. through 7:00 a.m. the following Sunday, and each Sunday after the hour of 8:00 p.m.

## Impacts and Mitigation Measures

- a. Would the project expose persons to or generate noise levels in excess of standards established in a local general plan or noise ordinance or applicable standards of other agencies?*
- d. Would the project result in a substantial temporary or periodic increase in ambient noise levels in the project vicinity above levels existing without the project?*

### **Impact NOI-1: Exposure of Noise-Sensitive Land Uses to Substantial Construction Noise or Noise in Excess of Sacramento County Noise Standards**

Construction activities would occur during daylight hours, up to 10 hours per day, 7 days per week.

Equipment that is expected to be used during construction is listed in Appendix B, “Air Quality and Climate Change Technical Appendix.” Primary noise-generating equipment that will be used on land at the staging/control location:

- grader,
- forklift, and
- flatbed tractor/trailer,

Primary noise-generating equipment that will be used on the water to install and remove the barrier:

- tug,
- barge-mounted crane,
- vibratory hammer pile driver,
- work boat,
- diesel or liquid propane gas (LPG) generator, and
- air compressor.

Table NOI-3 summarizes typical noise levels produced by this equipment.  $L_{max}$  sound levels at 50 feet are shown along with the typical acoustic use factor. The acoustic use factor is the percentage of time each piece of construction equipment is assumed to be operating at full power (i.e., its loudest condition) during construction operation and is used to estimate  $L_{eq}$  values from  $L_{max}$  values. For example the  $L_{eq}$  value for a piece of equipment that operates at full power 50% of the time (acoustical use factor of 50) is 3 dB less than the  $L_{max}$  value.

**Table NOI-3. Typical Construction Noise Emission Levels**

| Equipment                            | Typical Noise Level ( $L_{max}$ ) <sup>a</sup> | Acoustical Use Factor |
|--------------------------------------|--|-----------------------|
| Equipment on land                    |  |                       |
| Grader                               | 85   | 40                    |
| Forklift <sup>b</sup>                | 75   | 40                    |
| Flatbed tractor/trailer <sup>c</sup> | 76   | 40                    |
| Equipment on water                   |  |                       |
| Tugboat <sup>d</sup>                 | 91   | 40                    |
| Crane                                | 81   | 16                    |
| Vibratory pile driver                | 101  | 20                    |
| Workboat <sup>b</sup>                | 75   | 40                    |
| Generator                            | 81   | 50                    |
| Air compressor                       | 78   | 40                    |

Source: Federal Highway Administration 2006.

<sup>a</sup> dBA, A-weighted decibel level, measured at 50 feet.

<sup>b</sup> Based on data for pickup truck.

<sup>c</sup> Based on data for dump truck.

<sup>d</sup> Calculated for tugboat using 1,000 hp reciprocating engine with muffler (Hoover & Keith 2000).

Noise from equipment operations on land and on the water is estimated based on the three loudest pieces of equipment likely to operate at the same time. For the equipment on land, the total noise level for a grader, forklift, and flatbed tractor/trailer is 82 dBA at 50 feet. This corresponds to a sound level of 64 dBA  $L_{eq}$  at the nearest residences (400 feet). This indicates that there is potential for construction equipment operations on land to exceed Sacramento County noise standards during nonexempt hours. However, construction would generally not occur before 6 a.m. or later than 8 p.m. on weekdays or before 7 a.m. or later than 8 p.m. on weekends.

For construction equipment on the water, noise from the tugboat, crane, and barge with vibratory driver has been summed to develop a reasonable worst-case noise level for on-water construction activities. For this equipment the total noise level is 95 dBA  $L_{eq}$  at 50 feet. This corresponds to a sound level of 83 dBA at the nearest residences (200 feet). This indicates that there is potential for equipment operations on the water to exceed Sacramento County noise standards during nonexempt hours.

Because of the potential for construction noise to exceed Sacramento County noise standards during nonexempt hours and because of the low level of ambient noise, this impact is considered to be significant. Implementation of Mitigation Measure NOI-MM-1 would reduce this impact to a less-than-significant level. Additionally, the implementation of a noise coordinator during construction, as described in the Environmental Commitments section of Chapter 2, would allow residents disturbed by the noise to inform the construction contractor, who can make adjustments to timing and location of construction activities.

#### **Mitigation Measure NOI-MM-1: Employ Noise-Reducing Construction Measures**

DWR will employ noise-reducing construction practices so that construction noise does not exceed noise standards at residences during nonexempt hours specified in the Sacramento County Code.

Measures that can be used to limit noise include but are not limited to:

- locating equipment as far a practical from noise-sensitive uses;
- requiring that all construction equipment powered by gasoline or diesel engines have sound-control devices that are at least as effective as those originally provided by the manufacturer and that all equipment be operated and maintained to minimize noise generation;
- prohibiting gasoline or diesel engines from having unmuffled exhaust;
- using noise-reducing enclosures around noise-generating equipment; and
- constructing temporary barriers between noise sources and noise-sensitive land uses or taking advantage of existing barrier features (terrain, structures) to block sound transmission.

#### **Impact NOI-2: Exposure of Noise-Sensitive Land Uses to Substantial Operational Noise or Noise in Excess of Sacramento County Noise Standards**

The barrier creates underwater noise as part of its normal operation. Because of the impedance mismatch between water and air, sound produced underwater does not result in substantial airborne noise above the water. In addition, observations of similar bioacoustic barriers indicate that these devices do not produce distinctly audible airborne sound.

The only other noise sources associated with operation of the barrier are a generator and air compressor that would operate at the control site, potentially 24 hours a day for less than 60 days.

Using source levels in Table NOI-3, a generator and air compressor operating full time are estimated to produce a sound level of 83 dBA  $L_{eq}$  at 50 feet. This corresponds to a sound level of 65 dBA  $L_{eq}$  at the nearest residences (400 feet). This indicates that there is potential for equipment operations on land to exceed Sacramento County noise standards during nonexempt hours. Additionally, with relative low existing ambient noise levels in the project area, particularly at night, this could result in a substantial increase in noise during the period of barrier operation. This impact therefore is considered to be significant.

Implementation of Mitigation Measure NOI-MM-2 would reduce this impact to a less-than-significant level.

#### **Mitigation Measure NOI-MM-2: Employ Noise-Reducing Operational Measures**

The project applicant will employ noise-reducing measures during project operation so that operational noise does not exceed noise standards specified in the Sacramento County Code (55 dBA during daytime hours and 50 dBA during nighttime hours).

Measures that can be used to limit noise include but are not limited to:

- locating the generator and compressor units as far as possible from residences,
- using upgraded mufflers on the generator and compressor units, and
- providing acoustically designed enclosures around the generator and compressor units.

#### ***b. Would the project expose persons to or generate excessive groundborne vibration or groundborne noise levels?***

#### **Impact NOI-3: Exposure of Noise-Sensitive Land Uses to Excessive Groundborne Vibration or Groundborne Noise**

Construction activities associated with the operation of heavy equipment may generate localized groundborne vibration. Vibration from non-impact construction activity such as graders and loaders is typically below the Federal Transit Administration (FTA) residential compatibility threshold when the activity is more than about 75 feet from the receptor (Federal Transit Administration 2006). Vibration from vibratory pile driving is typically below the threshold beyond about 300 feet. With residences located as close as 200 feet from the supports, there may be some perceptible vibration at the closest residences. However, because of the short duration of this activity (2 days, with driving occurring only for 10 minutes for each of the 20 piles), this impact is considered to be less than significant and no mitigation is required.

#### ***c. Would the project result in a substantial permanent increase in ambient noise levels in the project vicinity above levels existing without the project?***

The barrier would be operated for less than 60 days in the spring of 2011. As such, there would be no permanent changes in ambient noise levels and no impact.

- e. Would the project be located within an airport land use plan area, or, where such a plan has not been adopted, within two miles of a public airport or public use airport and expose people residing or working in the project area to excessive noise levels?*
- f. Would the project be located in the vicinity of a private airstrip and expose people residing or working in the project area to excessive noise levels?*

There is a small single runway airport located about 2 miles southeast of the project area. There are also small agricultural airstrips in the area. Because of the infrequent use of these facilities and the short duration of the proposed project, people working on the proposed project would not be exposed to excessive noise from these facilities. As such, there would be no impact.

### XIII. Population and Housing

| XIII. Population and Housing |  | Potentially<br>Significant<br>Impact | Less-than-<br>Significant with<br>Mitigation<br>Incorporated | Less-than-<br>Significant<br>Impact | No<br>Impact                        |
|------------------------------|--|--------------------------------------|--|-------------------------------------|-------------------------------------|
| Would the project:           |  |                                      |  |                                     |                                     |
| a.                           | Induce substantial population growth in an area, either directly (e.g., by proposing new homes and businesses) or indirectly (e.g., through extension of roads or other infrastructure)? | <input type="checkbox"/>             | <input type="checkbox"/>                                     | <input type="checkbox"/>            | <input checked="" type="checkbox"/> |
| b.                           | Displace a substantial number of existing housing units, necessitating the construction of replacement housing elsewhere?  | <input type="checkbox"/>             | <input type="checkbox"/>                                     | <input type="checkbox"/>            | <input checked="" type="checkbox"/> |
| c.                           | Displace a substantial number of people, necessitating the construction of replacement housing elsewhere?  | <input type="checkbox"/>             | <input type="checkbox"/>                                     | <input type="checkbox"/>            | <input checked="" type="checkbox"/> |

The proposed project would be located primarily in the Sacramento River, with some land-based activity in a small staging area adjacent to the barrier and a loading area south of the staging area (Figure 2-1). No land uses would be altered, and the proposed project would require no new housing. Few workers would be needed to construct and operate the barrier, and because the project is of short duration, no workers are expected to require long-term housing. No existing residences or people would be displaced. Operation of the barrier would allow DWR to collect information about the effectiveness of a non-physical barrier at this site. This information could be used in the future to design similar deterrent devices and/or structures that could improve their ability to manage the SWP, including more stable and/or increased deliveries. However, the proposed project is a pilot study and it is speculative to predict the outcome of the study or how it might eventually lead to changes in water supply and related growth or changes in population and housing. As such, there is no impact.

## XIV. Public Services

| <b>XIV. Public Services</b>  | Potentially<br>Significant<br>Impact | Less-than-<br>Significant with<br>Mitigation<br>Incorporated | Less-than-<br>Significant<br>Impact | No<br>Impact                        |
|--|--------------------------------------|--|-------------------------------------|-------------------------------------|
| Would the project:   |                                      |  |                                     |                                     |
| a. Result in substantial adverse physical impacts associated with the provision of new or physically altered governmental facilities or a need for new or physically altered governmental facilities, the construction of which could cause significant environmental impacts, in order to maintain acceptable service ratios, response times, or other performance objectives for any of the following public services: |                                      |  |                                     |                                     |
| Fire protection?   | <input type="checkbox"/>             | <input type="checkbox"/>                                     | <input type="checkbox"/>            | <input checked="" type="checkbox"/> |
| Police protection?   | <input type="checkbox"/>             | <input type="checkbox"/>                                     | <input type="checkbox"/>            | <input checked="" type="checkbox"/> |
| Schools?   | <input type="checkbox"/>             | <input type="checkbox"/>                                     | <input type="checkbox"/>            | <input checked="" type="checkbox"/> |
| Parks?   | <input type="checkbox"/>             | <input type="checkbox"/>                                     | <input type="checkbox"/>            | <input checked="" type="checkbox"/> |
| Other public facilities?   | <input type="checkbox"/>             | <input type="checkbox"/>                                     | <input type="checkbox"/>            | <input checked="" type="checkbox"/> |

The proposed project is a short-term pilot study that would occur in 2011 with minimal construction and operation equipment. None of the associated activities would generate an increased need for public services, nor would activities disrupt such services. Activities would be confined to the Sacramento River and the small staging and loading areas (Figure 2-1). As such, there would be no impact.

## XV. Recreation

| XV. Recreation     |   | Potentially<br>Significant<br>Impact | Less-than-<br>Significant with<br>Mitigation<br>Incorporated | Less-than-<br>Significant<br>Impact | No<br>Impact                        |
|--------------------|---|--------------------------------------|--|-------------------------------------|-------------------------------------|
| Would the project: |   |                                      |  |                                     |                                     |
| a.                 | Increase the use of existing neighborhood and regional parks or other recreational facilities such that substantial physical deterioration of the facility would occur or be accelerated? | <input type="checkbox"/>             | <input type="checkbox"/>                                     | <input type="checkbox"/>            | <input checked="" type="checkbox"/> |
| b.                 | Include recreational facilities or require the construction or expansion of recreational facilities that might have an adverse physical effect on the environment?                        | <input type="checkbox"/>             | <input type="checkbox"/>                                     | <input type="checkbox"/>            | <input checked="" type="checkbox"/> |

## Physical Setting

The proposed project is located on the Sacramento River at the divergence of Georgiana Slough. Three marinas exist immediately upstream of the project area in Walnut Grove (Walnut Grove Marina, Landing 63, and Boathouse Marina), and three more exist just downstream of the project area on the Sacramento River (Dagmar's Landing, Ko-Ket Resort, and Deckhands Marina). Combined, these marinas offer extensive recreational opportunities, including boating, swimming, fishing, golfing, and hiking. In addition to these facilities located in the immediate project vicinity, dozens more marinas and other facilities offer boat access to the Sacramento River and other channels in the Delta that provide access to the project area (Delta Recreation 2010).

According to a boating survey conducted by the Delta Protection Commission (DPC), boating is the most popular recreational activity in the Delta and power boats are the most common vessel type. Personal watercraft were the second most common vessel (15.1%), followed by sailboats (6.2%), paddle boats (5.6%), and houseboats (4.0%). The proposed project is located in DPC's Zone C, which is also the second most popular zone of all Delta zones to launch and operate boats. Boating in the project area occurs year-round, with summer months being the most popular. Only 4.2% of the respondents said they boat in the Delta between midnight and 8 a.m., with 76% responding that they boat only between the hours of 8 a.m. and 4 p.m. In summary, most boating in the proposed project area occurs during daytime summer months. (Delta Protection Commission 1997.)

## Impacts and Mitigation Measures

- a. Would the proposed project increase the use of existing neighborhood and regional parks or other recreational facilities such that substantial physical deterioration of the facility would occur or be accelerated?*
- b. Would the proposed project include recreational facilities or require the construction or expansion of recreational facilities that might have an adverse physical effect on the environment?*

### **Impact REC-1: Temporary Disruption to Boaters during Construction and Operation of the Barrier**

Construction of the barrier would require some in-water equipment, and divers would be in the water installing the structure. Construction would occur over a 2-week period and would occupy approximately one-half of the Sacramento River channel at any given time. During construction, boaters would be able to pass through the project area, and navigation would not be disrupted.

During operation, the barrier structure would be at least 8 feet below the water surface elevation at low tide, ensuring that boats that would be able to pass safely over the structure. As described in Chapter 2, signage would be installed to inform boaters of the presence and depth of the structure and direct them away from it. Passing over the structure would have no effect on vessels and as described in the Environmental Commitments section of Chapter 2, signage, buoys, and other directives would be in place around the barrier to notify boaters about its location. No navigation would be prohibited, either on the Sacramento River or Georgiana Slough, and no changes in recreation or recreational facilities are expected to occur. Operation would occur over a period of less than 60 days in spring, and upon removal of the barrier structure, no permanent change would have occurred. Additionally, operation would not affect tidal hydraulics in the area, and boating facilities in the immediate vicinity would be able to continue normal operations. As such, the changes in recreation, specifically boating access in the project area, would be less than significant, and no mitigation is required.

## XVI. Transportation and Traffic

| XVI. Transportation/Traffic   | Potentially<br>Significant<br>Impact | Less-than-<br>Significant with<br>Mitigation<br>Incorporated | Less-than-<br>Significant<br>Impact | No<br>Impact                        |
|---|--------------------------------------|--|-------------------------------------|-------------------------------------|
| Would the project:  |                                      |  |                                     |                                     |
| a. Conflict with an applicable plan, ordinance, or policy establishing measures of effectiveness for the performance of the circulation system, taking into account all modes of transportation, including mass transit and non-motorized travel and relevant components of the circulation system, including, but not limited to, intersections, streets, highways and freeways, pedestrian and bicycle paths, and mass transit? | <input type="checkbox"/>             | <input type="checkbox"/>                                     | <input checked="" type="checkbox"/> | <input type="checkbox"/>            |
| b. Conflict with an applicable congestion management program, including, but not limited to, level-of-service standards and travel demand measures or other standards established by the county congestion management agency for designated roads or highways?  | <input type="checkbox"/>             | <input type="checkbox"/>                                     | <input checked="" type="checkbox"/> | <input type="checkbox"/>            |
| c. Result in a change in air traffic patterns, including either an increase in traffic levels or a change in location that results in substantial safety risks?   | <input type="checkbox"/>             | <input type="checkbox"/>                                     | <input type="checkbox"/>            | <input checked="" type="checkbox"/> |
| d. Substantially increase hazards because of a design feature (e.g., sharp curves or dangerous intersections) or incompatible uses (e.g., farm equipment)?  | <input type="checkbox"/>             | <input type="checkbox"/>                                     | <input checked="" type="checkbox"/> | <input type="checkbox"/>            |
| e. Result in inadequate emergency access?   | <input type="checkbox"/>             | <input type="checkbox"/>                                     | <input checked="" type="checkbox"/> | <input type="checkbox"/>            |
| f. Conflict with adopted policies, plans, or programs regarding public transit, bicycle or pedestrian facilities, or otherwise decrease the performance or safety of such facilities?   | <input type="checkbox"/>             | <input type="checkbox"/>                                     | <input checked="" type="checkbox"/> | <input type="checkbox"/>            |

## Physical Setting

The primary roads in the project area are SR 160, Andrus Island/Isleton Road, and River Road. Interstate-5 (I-5), Twin Cities Road, and Walnut Grove–Thornton Road would be used for regional access to and from the site. I-5 is a major north-south corridor spanning from the border with Mexico to the border with Canada, but the other roads that would be used for the proposed project are two-lane rural roads. Table TRN-1 shows daily traffic counts for each of the roads that could be used to access the proposed project. Because the proposed project area is agricultural and industrial in nature, large trucks and farm equipment in addition to passenger vehicles frequently use these roads.

**Table TRN-1. Vehicle Usage for Roads in the Proposed Project Area**

| Road                                    | Daily Traffic Counts | Source   |
|---|----------------------|--|
| Interstate 5 <sup>a</sup>               | 62,000               | California Department of Transportation 2010a        |
| Twin Cities Road <sup>b</sup>           | 6,181                | Sacramento County Department of Transportation 2010a |
| Walnut Grove–Thornton Road <sup>b</sup> | 3,920                | Sacramento County Department of Transportation 2010b |
| River Road <sup>b</sup>                 | 6,122                | Sacramento County Department of Transportation 2010c |
| State Route 160 <sup>a</sup>            | 3,600                | California Department of Transportation 2010b        |
| Andrus Island/Isleton Road <sup>b</sup> | 2,489                | Sacramento County Department of Transportation 2010d |

<sup>a</sup> Traffic counts for I-5 and SR 160 were generated by Caltrans and the peak daily traffic over the busiest traffic month is used in this table.

<sup>b</sup> Traffic counts for Twin Cities Road, Walnut Grove–Thornton Road, River Road, and Andrus Island/Isleton Road were generated by Sacramento County based on a one-time traffic count.

## Impacts and Mitigation Measures

- a. Would the proposed project conflict with an applicable plan, ordinance, or policy establishing measures of effectiveness for the performance of the circulation system, taking into account all modes of transportation, including mass transit and non-motorized travel and relevant components of the circulation system, including, but not limited to, intersections, streets, highways and freeways, pedestrian and bicycle paths, and mass transit?*
- b. Would the proposed project conflict with an applicable congestion management program, including, but not limited to, level-of-service standards and travel demand measures or other standards established by the county congestion management agency for designated roads or highways?*
- d. Would the proposed project substantially increase hazards because of a design feature (e.g., sharp curves or dangerous intersections) or incompatible uses (e.g., farm equipment)?*
- e. Would the proposed project Result in inadequate emergency access?*
- f. Would the proposed project conflict with adopted policies, plans, or programs regarding public transit, bicycle or pedestrian facilities, or otherwise decrease the performance or safety of such facilities?*

### Impact TRN-1: Temporary Increase in Traffic

The proposed project temporarily would add up to 70 roundtrips to and from the site over an approximate 13-week period. Compared to the existing levels and types of traffic on the roads that would be used, the proposed project would not have an effect on circulation, level of service, or other standards because the number of vehicles associated with the proposed project is a very small percentage of total traffic, the project would be temporary, and the types of vehicles accessing the

area are similar to the types of vehicles currently using these roads. Additionally, the presence of these vehicles on the project area roads would not impede emergency access to the project area or other areas along the roads used during the proposed project. No changes in roadway configurations or ingress and egress points are expected that could result in any new hazards compared to the existing conditions. As such, this impact is less than significant, and no mitigation is required.

***c. Would the proposed project result in a change in air traffic patterns, including either an increase in traffic levels or a change in location that results in substantial safety risks?***

The proposed project is located in rural Sacramento County, and there are no major airports in the vicinity that would be affected by the proposed project. As described above, there is one known airport within 2 miles of the proposed project, but the implementation of the proposed project would not require changes in any air traffic patterns or air traffic levels, nor would there be any increased risks to the proposed project workers or those operating aircraft. As such, there would be no changes to air traffic, and there would be no impact.

## XVII. Utilities and Service Systems

| XVII. Utilities and Service Systems |   | Potentially<br>Significant<br>Impact | Less-than-<br>Significant with<br>Mitigation<br>Incorporated | Less-than-<br>Significant<br>Impact | No<br>Impact                        |
|-------------------------------------|---|--------------------------------------|--|-------------------------------------|-------------------------------------|
| Would the project:                  |   |                                      |  |                                     |                                     |
| a.                                  | Exceed wastewater treatment requirements of the applicable Regional Water Quality Control Board?  | <input type="checkbox"/>             | <input type="checkbox"/>                                     | <input type="checkbox"/>            | <input checked="" type="checkbox"/> |
| b.                                  | Require or result in the construction of new water or wastewater treatment facilities or expansion of existing facilities, the construction of which could cause significant environmental effects?                           | <input type="checkbox"/>             | <input type="checkbox"/>                                     | <input type="checkbox"/>            | <input checked="" type="checkbox"/> |
| c.                                  | Require or result in the construction of new stormwater drainage facilities or expansion of existing facilities, the construction of which could cause significant environmental effects?                                     | <input type="checkbox"/>             | <input type="checkbox"/>                                     | <input type="checkbox"/>            | <input checked="" type="checkbox"/> |
| d.                                  | Have sufficient water supplies available to serve the project from existing entitlements and resources, or would new or expanded entitlements be needed?  | <input type="checkbox"/>             | <input type="checkbox"/>                                     | <input type="checkbox"/>            | <input checked="" type="checkbox"/> |
| e.                                  | Result in a determination by the wastewater treatment provider that serves or may serve the project that it has adequate capacity to serve the project's projected demand in addition to the provider's existing commitments? | <input type="checkbox"/>             | <input type="checkbox"/>                                     | <input type="checkbox"/>            | <input checked="" type="checkbox"/> |
| f.                                  | Be served by a landfill with sufficient permitted capacity to accommodate the project's solid waste disposal needs?   | <input type="checkbox"/>             | <input type="checkbox"/>                                     | <input checked="" type="checkbox"/> | <input type="checkbox"/>            |
| g.                                  | Comply with federal, state, and local statutes and regulations related to solid waste?  | <input type="checkbox"/>             | <input type="checkbox"/>                                     | <input type="checkbox"/>            | <input checked="" type="checkbox"/> |

## Physical Setting

The proposed project is located in rural Sacramento County on the Sacramento River, adjacent to Walnut Grove. The area is served by the Sacramento Area Sewer District and the Sacramento Regional County Sanitation District. The Florin-Perkins Public Disposal Site, located just northeast of the proposed project in south Sacramento, has a capacity of 500 tons/day and processes primarily construction and demolition debris.

## Impacts and Mitigation Measures

- a. Would the proposed project exceed wastewater treatment requirements of the applicable Regional Water Quality Control Board?*
- b. Would the proposed project require or result in the construction of new water or wastewater treatment facilities or expansion of existing facilities, the construction of which could cause significant environmental effects?*
- c. Would the proposed project require or result in the construction of new stormwater drainage facilities or expansion of existing facilities, the construction of which could cause significant environmental effects?*
- d. Would the proposed project have sufficient water supplies available to serve the project from existing entitlements and resources, or would new or expanded entitlements be needed?*
- e. Would the proposed project result in a determination by the wastewater treatment provider that serves or may serve the project that it has adequate capacity to serve the project's projected demand in addition to the provider's existing commitments?*

The proposed project would not require any new water sources nor would it generate new wastewater. As such, no new facilities would be required for delivery, use or treatment of water. There would be no impact.

- f. Would the proposed project be served by a landfill with sufficient permitted capacity to accommodate the project's solid waste disposal needs?*

### **Impact UT-1: Generation of Solid Waste during Construction and Removal of the Barrier**

The proposed project would generate some solid waste from construction workers and barrier material packaging. Additionally, some components of the barrier may be disposed of upon completion of the study. As described above, the nearest landfill accepts 500 tons of waste per day. The proposed project would generate only a very small amount of waste and would last only a very short period of time (up to 13 weeks). As such, the proposed project's waste easily could be accommodated by the Florin-Perkins Public Disposal Site. This impact is less than significant, and no mitigation is required.

- g. Would the proposed project comply with federal, state, and local statutes and regulations related to solid waste?*

As described above, the proposed project is not expected to generate a substantial amount of waste. The waste that is created would be non-toxic and disposed of at the Florin-Perkins Public Disposal Site, which processes primarily construction materials and debris. As such, there would be no impact.

## XVIII. Mandatory Findings of Significance

| XVIII. Mandatory Findings of Significance |  | Potentially<br>Significant<br>Impact | Less-than-<br>Significant with<br>Mitigation<br>Incorporated | Less-than-<br>Significant<br>Impact | No<br>Impact             |
|---|--|--------------------------------------|--|-------------------------------------|--------------------------|
| a.  | Does the project have the potential to degrade the quality of the environment, substantially reduce the habitat of a fish or wildlife species, cause a fish or wildlife population to drop below self-sustaining levels, threaten to eliminate a plant or animal community, substantially reduce the number or restrict the range of a rare or endangered plant or animal, or eliminate important examples of the major periods of California history or prehistory? | <input type="checkbox"/>             | <input type="checkbox"/>                                     | <input checked="" type="checkbox"/> | <input type="checkbox"/> |
| b.  | Does the project have impacts that are individually limited but cumulatively considerable? ("Cumulatively considerable" means that the incremental effects of a project are considerable when viewed in connection with the effects of past projects, the effects of other current projects, and the effects of probable future projects.)   | <input type="checkbox"/>             | <input type="checkbox"/>                                     | <input checked="" type="checkbox"/> | <input type="checkbox"/> |
| c.  | Does the project have environmental effects that will cause substantial adverse effects on human beings, either directly or indirectly?  | <input type="checkbox"/>             | <input type="checkbox"/>                                     | <input checked="" type="checkbox"/> | <input type="checkbox"/> |

***a. Does the proposed project have the potential to degrade the quality of the environment, substantially reduce the habitat of a fish or wildlife species, cause a fish or wildlife population to drop below self-sustaining levels, threaten to eliminate a plant or animal community, substantially reduce the number or restrict the range of a rare or endangered plant or animal, or eliminate important examples of the major periods of California history or prehistory?***

The proposed project would result in very minor changes in the environment and these changes would occur over a very short period of time. As described in previous sections of the checklist, there is little potential for substantial effects on biological, cultural, or physical conditions in and around the project area. Where impacts may occur, mitigation has been incorporated to reduce impacts to less-than-significant levels. Additionally, several Environmental Commitments have been included in the proposed project to minimize issues associated with navigation, erosion, accidental spills, minor changes in riparian habitat, fish behavior at the barrier structure, construction and operational noise, air emissions, and turbidity. Overall, the proposed project would not have any substantial impacts on the environment.

***b. Does the proposed project have impacts that are individually limited but cumulatively considerable? (“Cumulatively considerable” means that the incremental effects of a project are considerable when viewed in connection with the effects of past projects, the effects of other current projects, and the effects of probable future projects.)***

The proposed project is a temporary study to evaluate the effectiveness of a non-physical barrier on the Sacramento River at Georgiana Slough. The project is intended to support meeting the requirements of NMFS OCAP BO RPA as described above and in Chapter 1. The project duration would be approximately 13 weeks, including approximately 2 weeks of construction (includes barrier frame assembly and in-water construction activities) and 10 days of removal. None of the impacts of the proposed project would occur beyond that timeframe and none would be considerable given the mitigation and environmental commitments that would be implemented as part of the proposed project. As such, there would be no significant cumulative impacts.

***c. Does the project have environmental effects that will cause substantial adverse effects on human beings, either directly or indirectly?***

The proposed project would occur over a short period of time, during which increased noise and air emissions would occur, and a new structure would be introduced to the Sacramento River. Mitigation measures and environmental commitments to avoid and minimize these impacts are included in the project. No substantial adverse effects would occur.



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## **XVII. Utilities and Service Systems**

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## **XVIII. Mandatory Findings of Significance**

No references cited.

## Chapter 5

### List of Preparers

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The following people prepared this Initial Study.

#### ICF International

| <b>Name</b>      | <b>Expertise/Role</b>                       |
|------------------|---|
| Gregg Roy        | Project Director                            |
| Jennifer Pierre  | Project Manager/CEQA Compliance             |
| Lesa Erecius     | Project Coordinator/Environmental Scientist |
| Marin Greenwood  | Fish Biologist                              |
| Harry Oakes      | Terrestrial Biologist                       |
| Gabriel Roark    | Archaeologist                               |
| Dave Buehler     | Acoustical Engineer                         |
| Laura Yoon       | Air Quality and Greenhouse Gas Analyst      |
| Carol-Anne Hicks | Document Preparation                        |
| Darle Tilly      | Technical Editor                            |

#### California Department of Water Resources

| <b>Name</b>    | <b>Expertise/Role</b>     |
|----------------|---------------------------|
| Jacob McQuirk  | Project Manager           |
| Ryan Reeves    | Assistant Project Manager |
| Kari Bianchini | Project Engineer          |



## **Mitigation Monitoring and Reporting Program**

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# Appendix A

## Mitigation Monitoring and Reporting Program

**Table A-1. Mitigation Monitoring and Reporting Program for the 2011 Georgiana Slough Non-Physical Barrier Study**

| Description of Measure   | Type of Action                    | Implementation Schedule          | Party Responsible for Implementation/ Verification | Signature | Date |
|--|-----------------------------------|----------------------------------|--|-----------|------|
| <b>AESTHETICS</b>  |                                   |                                  |  |           |      |
| None   |                                   |                                  |  |           |      |
| <b>AGRICULTURAL RESOURCES</b>  |                                   |                                  |  |           |      |
| None   |                                   |                                  |  |           |      |
| <b>AIR QUALITY</b>   |                                   |                                  |  |           |      |
| Implement Sacramento Metropolitan Air Quality Management District's basic and enhanced construction emission control practices to reduce fugitive dust | Environmental Commitment          | Prior to and during construction | Contractor   |           |      |
| <b>BIOLOGICAL RESOURCES</b>  |                                   |                                  |  |           |      |
| Return disturbed areas to pre-project conditions   | Environmental Commitment          | After construction               | DWR  |           |      |
| Prepare and implement an Erosion Control Plan  | Environmental Commitment          | Prior to and during construction | Contractor   |           |      |
| Implement turbidity monitoring during construction   | Environmental Commitment          | During construction              | Contractor   |           |      |
| Participate in a worker environmental awareness program  | Environmental Commitment          | Prior to construction            | Contractor   |           |      |
| Conduct pile driving with a vibratory driver   | Environmental Commitment          | During construction              | Contractor   |           |      |
| Monitor adult fish response  | Environmental Commitment          | During operation                 | DWR  |           |      |
| BIO-MM-1: Conduct surveys to locate Swainson's hawk nest sites   | CEQA-triggered mitigation measure | During operation and maintenance | DWR  |           |      |

| Description of Measure   | Type of Action                    | Implementation Schedule                                | Party Responsible for Implementation/ Verification |           |      |
|--|-----------------------------------|--|--|-----------|------|
|  |                                   |  |  | Signature | Date |
| BIO-MM-2: Minimize project-related disturbances within ¼ mile of active Swainson's hawk nest sites   | CEQA-triggered mitigation measure | During operation and maintenance                       | DWR  |           |      |
| BIO-MM-3: Conduct surveys to locate raptor nest sites  | CEQA-triggered mitigation measure | During operation and maintenance                       | DWR  |           |      |
| BIO-MM-4: Minimize project-related disturbances within ¼ mile of active nest sites   | CEQA-triggered mitigation measure | During operation and maintenance                       | DWR  |           |      |
| BIO-MM-5: Avoid and minimize effects on nesting birds  | CEQA-triggered mitigation measure | Prior to and during construction, and during operation | DWR  |           |      |
| BIO-MM-6: Install exclusion fencing for western pond turtle  | CEQA-triggered mitigation measure | Prior to construction                                  | DWR  |           |      |
| <b>CULTURAL RESOURCES</b>  |                                   |  |  |           |      |
| CUL-MM-1: Limit landside excavation and vegetation removal to the first 3 feet of sediment and monitor landside excavations deeper than 3 feet | CEQA-triggered mitigation measure | During construction                                    | Contractor   |           |      |
| CUL-MM-2: Stop work and evaluate the significance of inadvertent discoveries; devise treatment measures as needed                              | CEQA-triggered mitigation measure | During construction                                    | Contractor/DWR                                     |           |      |
| <b>GEOLOGY AND SOILS</b>   |                                   |  |  |           |      |
| Prepare and implement an Erosion Control Plan  | Environmental Commitment          | Prior to and during construction                       | Contractor   |           |      |
| <b>GREENHOUSE GAS EMISSIONS</b>  |                                   |  |  |           |      |
| None   |                                   |  |  |           |      |
| <b>HAZARDS AND HAZARDOUS MATERIALS</b>   |                                   |  |  |           |      |
| Prepare and implement a Hazardous Materials Management Program   | Environmental Commitment          | Prior to and during construction                       | Contractor   |           |      |
| <b>HYDROLOGY AND WATER QUALITY</b>   |                                   |  |  |           |      |
| Prepare and implement an Erosion Control Plan  | Environmental Commitment          | Prior to and during construction                       | Contractor   |           |      |

| Description of Measure   | Type of Action                    | Implementation Schedule          | Party Responsible for Implementation/ Verification |  | Signature | Date |
|--|-----------------------------------|----------------------------------|--|--|-----------|------|
|  |                                   |                                  |  |  |           |      |
| Prepare and implement a Hazardous Materials Management Program | Environmental Commitment          | Prior to and during construction | Contractor   |  |           |      |
| Implement turbidity monitoring during construction             | Environmental Commitment          | During construction              | Contractor   |  |           |      |
| <b>LAND USE AND PLANNING</b>                                   |                                   |                                  |  |  |           |      |
| None   |                                   |                                  |  |  |           |      |
| <b>MINERAL RESOURCES</b>                                       |                                   |                                  |  |  |           |      |
| None   |                                   |                                  |  |  |           |      |
| <b>NOISE</b>   |                                   |                                  |  |  |           |      |
| Designate noise disturbance coordinator                        | Environmental Commitment          | Prior to and during construction | Contractor   |  |           |      |
| NOI-MM-1: Employ noise-reducing construction measures          | CEQA-triggered mitigation measure | During construction              | Contractor   |  |           |      |
| NOI-MM-2: Employ noise-reducing operational measures           | CEQA-triggered mitigation measure | During operation                 | DWR  |  |           |      |
| <b>POPULATION AND HOUSING</b>                                  |                                   |                                  |  |  |           |      |
| None   |                                   |                                  |  |  |           |      |
| <b>PUBLIC SERVICES</b>   |                                   |                                  |  |  |           |      |
| None   |                                   |                                  |  |  |           |      |
| <b>RECREATION</b>  |                                   |                                  |  |  |           |      |
| Install in-water signage                                       | Environmental Commitment          | During operation                 | DWR  |  |           |      |
| <b>TRANSPORTATION/TRAFFIC</b>                                  |                                   |                                  |  |  |           |      |
| None   |                                   |                                  |  |  |           |      |
| <b>UTILITIES AND SERVICE SYSTEMS</b>                           |                                   |                                  |  |  |           |      |
| None   |                                   |                                  |  |  |           |      |



## **Air Quality and Climate Change Technical Appendix**

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## Appendix B

# Air Quality and Climate Change Technical Appendix

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The purpose of this technical appendix is to describe the modeling techniques used to estimate emissions associated with construction and operation of the proposed project.

## Project Construction

### Criteria Air Pollutants

Construction of the proposed project would generate short-term emissions of ROG, NO<sub>x</sub>, CO, PM<sub>10</sub>, and PM<sub>2.5</sub>. These emissions from heavy-duty construction equipment and vehicle travel were estimated using the URBEMIS2007, Version 9.2.4 model. It was assumed that work crews would be on site approximately two weeks prior to construction to remove trash and debris. During this time, the barrier frames will be shipped upstream via barge. Minor site grading/gravel spreading would also occur during this time, and would disturb no more than one (1) acre area.

Based on information provided by the project applicant, the following scheduling assumptions were made. It was assumed that work would begin in mid- to late February 2011 and occur 7 days per week, up to 10 hours per day.

- Construction Schedule
  - Two weeks prior to start of barrier construction: Crews prepare construction site and equipment shipped via barge. Minimal site grading/gravel spreading would require up to 1 day during this 2-week period.
  - Mid- to late February: Barrier Installation (8 days)<sup>1</sup>
  - Late May: Barrier Removal (10 days)

Preparation of the construction site was assumed to require five construction personnel, while installation and removal of the barrier would require fifteen (15) personnel. It was assumed that each worker would make two (2) trips to the construction site per day. This equates to 350 trips during the site preparation and installation phases in February, and 300 trips during the barrier removal phase in May.

Table B-1 summarizes the heavy-duty construction equipment and URBEMIS modeling assumptions for site grading and installation and removal of the barrier. Equipment horsepower and load factors were based on URBEMIS default values.

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<sup>1</sup> Heavy-duty equipment will only operate for 7 days during barrier installation.

**Table B-1. Equipment and Modeling Assumptions for Barrier Installation and Removal**

| Off-Road Equipment                      | Number | Horsepower | Max Daily Operation <sup>a</sup> | Total Hours per Phase <sup>b</sup> |
|---|--------|------------|----------------------------------|------------------------------------|
| <b>Site Grading/Gravel Spreading</b>    |        |            |                                  |                                    |
| Grader                                  | 1      | 174        | 4                                | 4                                  |
| <b>Barrier Installation and Removal</b> |        |            |                                  |                                    |
| Fork lift                               | 1      | 145        | 6                                | 42/60 <sup>c</sup>                 |
| Vibratory pile driver                   | 1      | 500        | 2.5 <sup>d</sup>                 | 5 <sup>d</sup>                     |
| Generator                               | 5      | 105        | 5                                | 35                                 |
| Barge Mounted Crane                     | 1      | 399        | 6                                | 42                                 |
| Pickup Trucks                           | 5      | 150        | – <sup>e</sup>                   | –                                  |

<sup>a</sup> Used to quantify maximum daily emissions. Represents the maximum time the equipment would operate in one day.

<sup>b</sup> Used to quantify total emissions. Represents the actual time the equipment will operate during each phase.

<sup>c</sup> Installation/Removal

<sup>d</sup> Assumes that a maximum of 20 piles will be driven and that each pile will require approximately 10 minutes to drive (approximately 200 minutes total driving time)

<sup>e</sup> Assumed two five mile trips per day

In addition to the heavy-duty construction equipment summarized in Table B-1, construction activities will require the use of a gasoline-powered workboat and diesel-powered tugboat. Table B-2 summarizes the vessel information assumed in the emissions modeling.

**Table B-2. In-Water Equipment Assumptions**

| In-Water Equipment                              | Number | Horsepower | Max Daily Operation <sup>a</sup> | Total Hours per Phase <sup>b</sup> |
|---|--------|------------|----------------------------------|------------------------------------|
| <b>Equipment Transport Up River<sup>c</sup></b> |        |            |                                  |                                    |
| Tugboat   | 1      | 1,000      | 8                                | 8                                  |
| <b>Barrier Installation and Removal</b>         |        |            |                                  |                                    |
| Tugboat <sup>d</sup>                            | 1      | 1,000      | 5                                | 35                                 |
| Survey Workboat                                 | 1      | 70         | 5                                | 30                                 |

<sup>a</sup> Used to quantify maximum daily emissions. Represents the maximum time the equipment would operate in one day.

<sup>b</sup> Used to quantify total emissions. Represents the actual time the equipment will operate during each phase.

<sup>c</sup> Equipment shipped in early February

<sup>d</sup> Used for barge mobilization

URBEMIS does not estimate emissions associated with in-water equipment. Consequently, emissions associated with operation of the workboat were estimated using EPA's AP-42 report (U.S. Environmental Protection Agency 2009 [1998]). AP-42 contains emission factors for various pieces of equipment; including gasoline powered internal combustion engines (see Table B-3). Total emissions were calculated using the emission factors summarized in Table B-3 and the following equation:

**Equation B-1:  $E = (\text{Activity}) \times (\text{EF}) \times (\text{LF}) \times (\text{Hp})$**

Where:

|          |   |   |
|----------|---|---|
| E        | = | Emissions, pounds                                 |
| Activity | = | Activity, hours                                   |
| EF       | = | Engine emissions factor (see Table B-3)           |
| LF       | = | Engine load factor, 0.43 (ICF International 2009) |
| Hp       | = | Horsepower, 70                                    |

**Table B-3. Workboat Emission Factors (pounds per horsepower-hour)**

| ROG <sup>a</sup> | NO <sub>x</sub> | CO      | PM10     | CO <sub>2</sub> <sup>b</sup> |
|------------------|-----------------|---------|----------|------------------------------|
| 0.15165          | 0.011           | 0.00696 | 0.000721 | 1.08                         |

<sup>a</sup> Calculated assuming the ratio of ROG to total organic compounds (TOC) is 0.933.

<sup>b</sup> Carbon dioxide is a GHG. See the following section for additional details.

Source: U.S. Environmental Protection Agency 2009 [1998] and 2005

Emissions from the tugboat were estimated using emission factors summarized in *Current Methodologies in Preparing Mobile Source Port-Related Emission Inventories* (ICF International 2009) (Table B-4). It was assumed the tugboat would be powered by a Category 1 Tier 0 engine<sup>2</sup>. Equation B-2 was used to calculate emissions.

**Equation B-2:  $E = (\text{kW}) \times (\text{Activity}) \times (\text{EF}) \times (\text{LF}) \times (\text{Hp}) \times 0.0022$**

Where:

|          |   |   |
|----------|---|---|
| E        | = | Emissions, pounds                                 |
| kW       | = | Kilowatts to horsepower conversion, 0.746         |
| Activity | = | Activity, hours                                   |
| EF       | = | Engine emissions factor (see Table B-4)           |
| LF       | = | Engine load factor, 0.31 (ICF International 2009) |
| Hp       | = | Horsepower, 1000                                  |
| 0.0022   | = | Conversion from grams to pounds                   |

**Table B-4. Tugboat Emission Factors (grams per kilowatt-hour)**

| ROG  | NO <sub>x</sub> | CO  | PM  | CO <sub>2</sub> <sup>a</sup> | CH <sub>4</sub> <sup>a</sup> | N <sub>2</sub> O <sup>a</sup> |
|------|-----------------|-----|-----|------------------------------|------------------------------|-------------------------------|
| 0.27 | 13              | 2.5 | 0.3 | 690                          | 0.02                         | 0.09                          |

<sup>a</sup> GHGs, see following section for additional details.

Source: ICF International 2009

<sup>2</sup> The “Category” of an engine is determined by the EPA, where Category 1: 1–5 liter per cylinder displacement (l/Cd), Category 2: 5–30 l/Cd, and Category 3: over 30 l/Cd. Similarly, engine standards are also broken down by engine year, where Tier 0 standards apply to engines 1999 and older, Tier 1 standards apply to engines constructed from 2000 to 2003, and Tier 2 standards apply to engines constructed from 2004 and 2007. New Tier 3 and 4 standards will be required for engines constructed from 2009 to 2013 and after 2014.

## Greenhouse Gas Emissions

### Existing Conditions and Proposed Project

GHG emissions from construction activities are primarily the result of fuel use by equipment, boats, and vehicles. The primary GHG emissions generated by construction activities are CO<sub>2</sub>, CH<sub>4</sub>, and N<sub>2</sub>O.

CO<sub>2</sub> emissions from construction equipment and vehicle use were estimated using URBEMIS2007 and the assumptions described above. URBEMIS does not quantify CH<sub>4</sub> and N<sub>2</sub>O emissions from off-road equipment or worker commutes. Emissions of CH<sub>4</sub> and N<sub>2</sub>O from diesel equipment were determined by scaling the construction CO<sub>2</sub> emissions predicted by URBEMIS by the ratio CH<sub>4</sub>/CO<sub>2</sub> (0.000057) and N<sub>2</sub>O/CO<sub>2</sub> (0.000026) emissions expected per gallon of diesel fuel according to CCAR (California Climate Action Registry 2009). GHG emissions from on road pickup trucks were determined by dividing the annual CO<sub>2</sub> emissions by 0.95. This statistic is based on EPA's recommendation that CH<sub>4</sub>, N<sub>2</sub>O, and other GHG emissions account for 5% of on road emissions (U.S. Environmental Protection Agency 2009).

CO<sub>2</sub> emissions from operation of the workboat were estimated using the emission factor summarized in Table B-3 and the assumptions described above. The EPA's AP-42 report does not contain emission factors for CH<sub>4</sub> and N<sub>2</sub>O. Emissions of CH<sub>4</sub> and N<sub>2</sub>O were therefore determined by scaling the calculated CO<sub>2</sub> emissions predicted by the ratio CH<sub>4</sub>/CO<sub>2</sub> (0.000025) and N<sub>2</sub>O/CO<sub>2</sub> (0.000073) emissions expected per gallon of gasoline fuel according to CCAR (California Climate Action Registry 2009). Emissions of CO<sub>2</sub>, CH<sub>4</sub>, and N<sub>2</sub>O generated by the diesel-powered tugboat were estimating using the emission factors in Table B-4 and Equation B-2.

## Project Operations

One (1) generator and one (1) air compressor would operate 24 hours every other day between during barrier study. Emissions generated by these sources were estimated using the URBEMIS2007 model. Please note that efforts are currently being undertaken to secure line power to the project site. If an appropriate conduit is secured, electric-powered equipment will operate the barrier instead of the diesel-powered generator and air compressor. However, because this conduit has not yet been secured, this analysis assumes operation of diesel-powered equipment.

It was assumed that four employees would travel to the site each day for equipment inspections. In addition, two maintenance divers would travel to the site once per week. Assuming each person would make two trips per visit, a total of 404 trips were assumed to occur during the barrier study.

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